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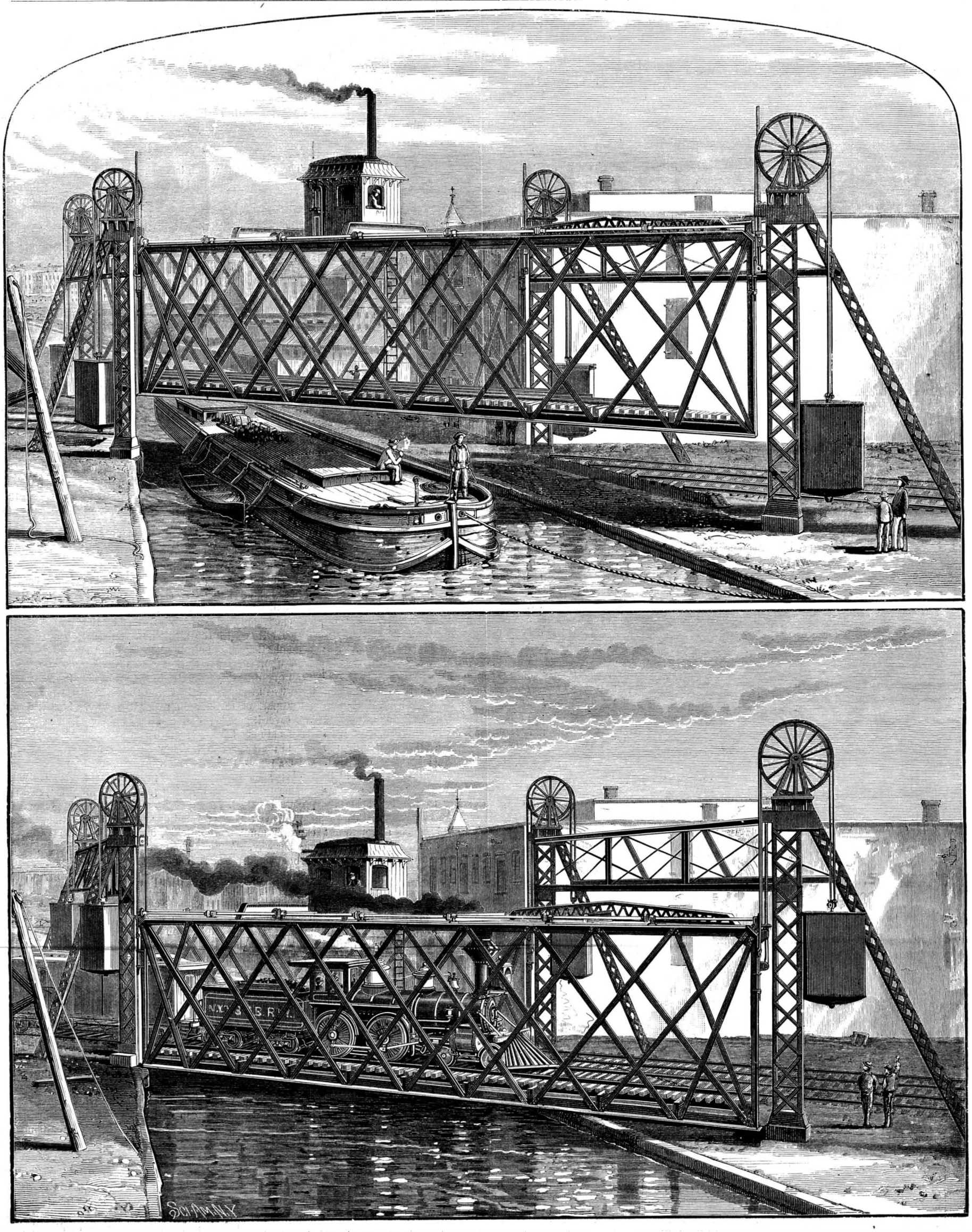

LIFTING BRIDGE FOR DOUBLE TRACK RAILWAY.—[See page 244.]

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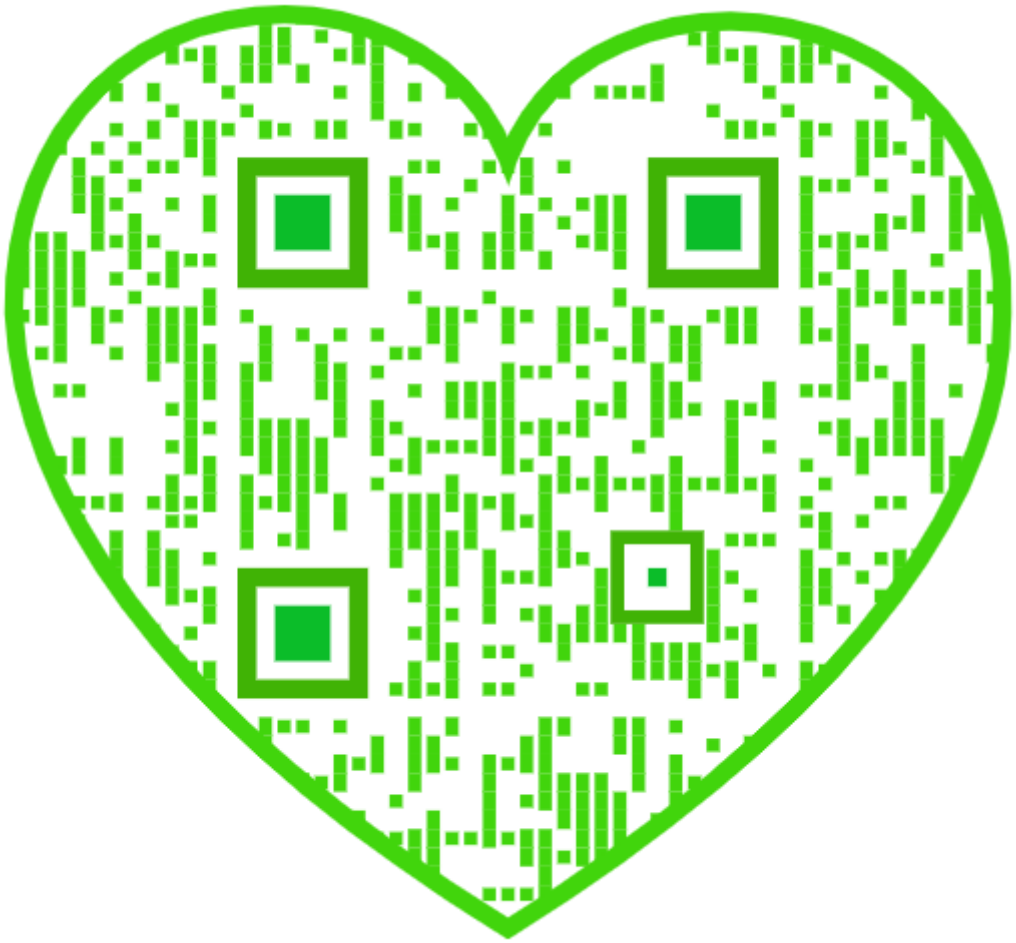

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NEW YORK, SATURDAY, OCTOBER 20, 1883.

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A NEW YORK OFFICE BUILDING.

We have carefully noted the work on the new building for the Mutual Life Insurance Company now in course of erection, on the site of the old Post Office, under the charge of Mr. Charles W. Clinton, architect. It will be a fine representative building, embodying all the modern improvements that have been developed in this country up to the present time, and it is because of these characteristics that we have compiled the following description.

The building fronts on Nassau, Cedar, and Liberty Streets, the entrance front, on Nassau Street, being 186 feet in length, and the fronts on Cedar and Liberty Streets being 111 feet and 115 feet, respectively. It will be eight stories in height, exclusive of the basement. It is to be regretted that so fine a building should be handicapped by its location, the streets upon which it fronts being so narrow that it is impossible to obtain a good view of the whole. To overcome this defect of sight the propriety of setting it back from the line on Nassau Street is so obvious that it must have occurred to the company, who, on the other hand, might with some reason not have felt satisfied in sacrificing the valuable renting space for what their patrons would perhaps judge to be purely æsthetic reasons.

The work so far is of the most solid and enduring character. The foundations have been designed with great care to insure equal pressures under every part of the superstructure. The piers are properly proportioned to sustain the weights, in their sectional areas and heights, according to the several materials of which they are built. The basement and first stories are of granite, the piers being built solidly of that material, not simply faced with it and backed up with brick, as is usually done. This mode prevents the evils resulting from unequal compression. The other stories, up to the eighth, are of a beautiful limestone from Indiana.

The interior construction is mainly of iron, consisting of rolled beams supported on plate girders which rest on cast and Phœnix wrought iron columns. A distinctive feature in the construction of the building lies in the fact that a separate iron girder spans the window heads of each story, which does not show on the exterior, however. These girders transfer the weight of the story above to the main pier, thus relieving the mullions of the weight and avoiding all danger of cracking the stone lintels.

The building is entirely fireproof, the spaces between the beams being spanned with fire brick, and the bottoms of the beams being protected with the same material, which is an unusual precaution. Most particular attention has been given to ventilation, and the heating will be complete, although by direct radiating coils, yet from the manner of introducing fresh air the best effects will be obtained. Steam will be furnished by the Steam Heating Company, although boilers will also be provided. Provision will be made for both gas and electric lighting, as well as for all the latest appliances, such as telephones, electric call bells, etc. An artesian well will assist in supplying the building with water.

Although the work has now reached only the sixth story, still enough is seen to show what its character will be. The style is an adaptation of the Italian Renaissance. The façade is divided into three features, the central part recessed and flanked by pavilions on Cedar and Liberty Streets. The stories are grouped so that they form three grand divisions, separated by horizontal belt or cornice courses. The basement and first story comprise the first division, the second and third stories the second, and the fourth, fifth, sixth, and seventh will form the upper division, and are to be inclosed in an arcade, the pilasters of which will be ornamented with flutings and richly carved capitals, the arches spanning the spaces between, strongly marked and elaborately enriched. The main cornice will surmount this feature. It is bold in design and contains all the complete enrichments, such as modillions, dentals, etc., according to the best examples found in Italian palaces.

As all the stories of the portico are in place, although not yet completed, a fair interpretation of the architect's idea may be seen. It is the most highly wrought feature of the façade, and is both striking and imposing. It is two stories in height, the first story being formed by large square granite piers with alternate polished courses in "rustica," flanked by massive granite columns. The capitals of both columns and piers are elegant in design and beautifully executed in white marble. The second story of the portico is similar in its distribution of parts, but with an arch springing from the entablature of the small columns, is more highly elaborated and carved in detail. The ceiling is vaulted and paneled, and the piers are covered with Renaissance carving. The capitals of the piers have heads typical of Europe, Asia, Africa, and America carved upon them, modeled and executed in a masterly style. This work was done by Mr. Samuel Kitson, from Rome.

These two stories taken together form a composition organic in its development, while the whole is fully sufficient to dominate the other large features of the work and accentuate and mark it as the main entrance of the building. The transmission from the plain severity of the pavilions to the concentrated enrichment of this portico is not violent, as the intermediate features, the arched windows on either side, carry the enrichment through, leading gradually up to the central feature. There will be an ornamental bronze gate at the portico entrance.

The drawings of the interior, which were shown us, indicate that the finish of this portion of the work will correspond in character with the exterior. The main entrance hall leading to the elevators will be finished most substantially in white marble, to make it as light as possible. The elevator doorways will be trimmed with the above named material, and the openings guarded by strong and ornamental brass grill work. The finish of the main office of the company, on second and third floors, will be handsome and dignified, while being free from extravagance. The columns will be of scagliola, with Corinthian capitals; and the ceiling will be paneled in plaster. A white marble wainscot of plain design will surround the room. The offices for renting will be most attractive in finish. A noticeable feature is the ample provision for light and air, the windows being unusually large in proportion to the piers, although the grouping and the depth of joints of the piers are so arranged as to give them great solidity in appearance as well as in fact.

The engineering throughout the work has been most thorough, the architect having placed Thomas E. Brown, Jr., C.E., in charge of this work.

The impression produced so far gives promise that the work when finished will be imposing and elegant, with sufficient plainness or severity to give dignity, relieved in certain parts with enrichments, giving value to the rest; a work of which the city may well be proud.

RAISING BREAD.

The elastic gas which is the agent employed in causing dough to "rise," so that it can produce light and palatable bread, is as a rule carbonic acid. In practical fact there are two distinct methods of introducing the acid into the dough. In the first we form it within the dough, *de novo;* in the second we mix it in a solid form and then set it free as a gas. For the first we use fermentation; for the second we use baking powder or its equivalent.

In fermentation the yeast, from the materials which it finds in the dough, forms two new substances (neither of them having been there before)—alcohol and carbonic acid. The presence of the alcohol is of decided importance, though it is not commonly recognized. Very few persons are aware of the amount of it which is produced in bread making. Of course, in the process of baking the greater part of it is evaporated, but it is a safe estimate to reckon that very nearly a thousand gallons are lost daily from the bread baked in New York alone. Some twenty-five years ago a company was formed in London and erected works for baking bread in such a way that the alcohol should be condensed and saved. It was easily done; the alcohol was made and sold to good advantage, but after expending at least $100,000 the company failed. Why? The alcohol was a clear profit. Yes, but they *could not sell their bread!* They evaporated the alcohol from it so closely that the people pronounced it unpalatable, and would not use it.

In fact, all good yeast bread contains still a very appreciable quantity of alcohol, and owes a part of its excellence to its presence. We may reckon the quantity at ten to twenty drops in an ordinary loaf of bread. Not enough, of course, to produce any physiological effect, and yet enough to affect the quality of the bread.

The carbonic acid, which is formed by the fermentation at the same time with the alcohol, not only acts mechanically as an elastic gas, but also by its refreshing and invigorating effect upon the stomach it assists digestion directly. The small quantity of yeast introduced multiplies itself rapidly, until when the process is well completed it has permeated every part of the dough, and "the whole is leavened." Wherever it goes it produces minute bubbles of gas; and each bubble at once tries to escape because of its elasticity, which is held under pressure. They struggle hither and thither, uniting together to form larger bubbles, until the whole mass has become porous and spongy; that is, the bread is "raised." The heat of baking stops the growth of the yeast, and the process is ended.

We have thus far formed our gas by fermentation, but we can do it much more quickly, on the instant, as it were, in another way. Any carbonate, acted upon by an acid, yields carbonic acid. Bicarbonate of soda is very cheap, and when decomposed affords a large bulk of gas. If therefore we can combine it with an acid which is of solid form, is cheap, and is both in itself and in its compounds harmless, we shall be able to work it into the dough, and the quickly resulting gas will "raise" the mass in a very few minutes.

The most convenient article for this purpose with which we are as yet acquainted is probably cream tartar, which is a bitartrate of potassa; at all events, this so completely satisfies the requirements, that it has come into very general use. Formerly the cream tartar and soda were mixed in the using, and this custom has not altogether passed away; but it was found convenient and profitable to blend them into one, and baking powder was the result, and no fault could be found with it, or the bread which it raised, so long as baking powder was honest. But alas for what is now sold us!

Good cream tartar bread is perfectly wholesome, but it lacks the alcohol, and can commonly be distinguished from yeast bread even by the taste, and this mode of "raising" is used chiefly for those forms which we will so unwisely persist in eating hot.

For herein comes to light the most important distinction between the two modes of raising dough. As formerly remarked, hot bread, biscuit, etc, ought never to be eaten by any one. But if we are bound at any rate to do it, there is much greater safety, and much more ease of digestion secured by the use of the cream tartar. The biscuit, etc.,

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made with it can within a very few minutes after baking pass through all the changes which in the other case require five or six hours. And until these molecular transformations have ceased, the bread is a fearful burden to a weak stomach.

But where it is to be eaten cold, as it should always be, yeast fermentation is what it has in all ages been, the *one* way to raise bread.

STEEL CASTINGS.

The qualities that steel castings should possess in order to fit them for safely replacing the main forgings now used in marine construction is a subject now being very generally studied, both in this country and Europe. It is well known that large forged stern frames are seldom absolutely sound, while the frequent breaking of wrought iron crank shafts proves that they cannot be relied upon, taken as a whole. If these parts can be made of cast steel which will be sound, homogeneous, free from internal strain, and having the requisite strength and ductility, it behooves ship builders to adopt that material. A paper on this subject, containing much information from various eminent steel makers in Europe, was recently compiled by Mr. William Parker, chief engineer surveyor of Lloyd's Register of Shipping.

The superiority of mild steel over iron for the principal structural parts is acknowledged, but in proof of this it is stated that last year seventy-three large steamships were built of steel and 116 vessels were being built of steel last January. During the course of the inquiry visits were made to three firms in England who make large castings, in addition to those who make heavy forgings, and the prominent steelmakers of France were consulted. Tests were made upon samples cut from castings and also upon the castings themselves, and similar tests were conducted upon pieces of forged iron and forged steel. The report says: "The result is that we are now convinced that structures can be made of cast steel quite as fit for the purpose intended as those usually constructed of wrought iron, and that they can, at the same time, be made in such a manner as to avoid the uncertainty inevitably associated with large iron forgings owing to the large number of weldings necessitated in them."

Messrs. Jessop hold that it is absolutely necessary to melt the steel in crucibles in order to secure a definite composition of the material and to obtain thorough homogeneity throughout a large casting. Messrs. Spencer & Sons use both crucibles and open-hearth furnaces, the size of the castings being the only guide, and they find no difference in the material. The Steel Company of Scotland use open-hearth furnaces for every purpose. The first two firms think that careful attention to the materials used will insure strength, ductility, solidity, and soundness. At the works of the Steel Company the metal is melted in an open-hearth Siemens furnace, the bath being a mixture of manganiferous pig iron and steel scrap. Hot steel scrap is then added until the bath contains a sufficiently low amount of carbon to give the product the desired hardness. Then is added an alloy called silicide of manganese, to insure solidity of the steel and freedom from blow holes, the metal being finally tapped into a ladle and run into moulds in the usual way. Oxidation, during the operation, is prevented as much as possible.

At Messrs. Jessop's the opinion is held that a uniform cooling of the original casting is the only means of insuring molecular equilibrium; but the other makers think that this cooling cannot be so uniformly performed as to leave the casting free from internal strains, which, they think, can only be got rid of by careful annealing. This annealing consists in slowly raising the temperature of the casting to a bright red heat, keeping it at that temperature for a time, and slowly cooling it. M. Pourcel, of Terre-Noire, attaches great importance to tempering castings in oil, in addition to annealing, in order to give them greater ductility. The first operation transforms the large crystalline grain of the metal into a finer and more homogeneous grain, and each repetition adds to the homogeneity, tenacity, and ductility. To prove this experiments were made upon four specimens cut from the same casting. The first was in the same condition as the casting, and broke with a tensile stress of 32·07 tons per square inch and an elongation of 16 per cent in a length of 5 inches; the second, which was annealed, broke at 33·7 tons per square inch with an elongation of 17 per cent; the third, which was annealed and tempered in oil, broke at 38·6 tons, with an elongation of 17 per cent; the fourth, which was twice tempered in oil, broke at 41·1 tons per square inch, with an elongation of 15 per cent.

Large shafts can only be made by a few firms possessing the necessary appliances for heavy work, and they are of various opinions as to the most suitable materials to be used and the best methods. It is almost universally thought that mechanical work done upon steel greatly improves its ductility. Sir Joseph Whitworth believes that the ductility of steel would reach its maximum if it were possible to subject it to a great pressure while in a fluid state, say a pressure of 20 tons to the square inch. He prefers steel of a tensile strength of 40 tons per square inch, having a ductility enabling it to elongate 30 per cent in a length of two inches.

Messrs. Vickers & Sons, at present the largest makers of steel crank shafts for marine purposes in the world, use a mild steel, having a tensile strength of only 24 tons per square inch, and the writer states that he knows of but one shaft of their manufacture that has broken. "And this to my mind is conclusive, seeing that shafts of hard steel are made of the same size as those of mild steel, that the relatively mild steel used by that firm has, by its ductility, a greater amount of *endurance* than harder steel, which enables it to better withstand the great and oft-repeated strains brought upon all marine crank shafts from the nature of their work."

Hammering increased the strength of a piece of steel casting 36 per cent and the elongation 10 per cent, while rolling it until the section was reduced to one-fifth increased the strength 30 per cent and the elongation 130 per cent. Other experiments show very little difference in regard to tensile strength, but show that ductility is greater in cases where the most work is put upon the material.

The German Carp and its Introduction into the United States.

In a paper read before the American Association, Mr. C. W. Smiley, of Washington, D. C., said he had some years ago imported from Germany thirty or forty pairs of this fish. They were placed in breeding ponds in Washington, and have increased manyfold, the number spawned this year being 400,000. The carp is naturally a warm water fish, and in the waters of the Southern States grows with astonishing rapidity, and to great size. They will also do well in the cold water of the North, even in Minnesota. Nearly every State and county in the United States has a fish commission, and they are all propagating carp. It has also been taken up as a private speculation, and carp are sold for breeding purposes as high as $5 per pair.

The carp roots about in the mud for aliment, and much resembles poultry in its manner of getting food. Carp aged three years are often found to weigh twelve to fifteen pounds, and a gain in weight of four pounds has been observed in a carp in one year. The carp is sluggish; while trout, bass, and other lively fish frisk about, and do not fatten so fast as the carp. Experiments have shown that female carp spawn at the age of one year in southern waters, at two years in colder waters, and in the extreme northern waters of the United States at three years. Other fish, turtles, muskrats, snakes, and even birds, eat young carp. A bird shot in Washington recently had in its stomach the heads of seventy-nine young carp. The United States Fish Commissioner recently sent out requests for information about carp experimented with in this country; most of the replies placing the carp on an equality with trout, bass, and shad as a food fish, while a few classed them with pike, and a very few said they had a muddy taste. The carp is the best pond fish yet known, and in a very small pond will thrive well, so that families may easily have their own fish garden if they have enough water to make a permanent pond. The carp is a very hardy fish for shipment, requiring little water to keep alive in. The United States Fish Commissioner is giving away carp, sending them by express to any point, the receiver paying express charges. The fish will thrive on table refuse and almost anything edible. Carp can be kept in winter in a tub in the cellar, the water requiring to be kept fresh. Care should be taken to keep poisonous substances out of carp ponds, and too much food should not be thrown in. In cooking carp, thorough cleansing is needed; and frying should be done in hot pans and hot grease.

As to the economics of this subject, Mr. Smiley said that fish culture was more and more becoming a part of the farmer's occupation, and thought that, not very long in the future, most of the farmers of the country would have little fish ponds in their door yards, both as a method of obtaining food and as an ornament to the homestead.

Electrical Appliances on Austrian Railroads.

A number of important apparatus are used by the Imperial Austrian State railways, and invented by the Chief Inspector of Railroads, Herr Pollitzer. They are:

(1) A central point blocking apparatus. The object of this apparatus is to control any pointsman from a central office and to prevent him from showing the line clear until ordered to do so by the central office. It consists of a small box and a manipulator. The box has an electric bell at the top and two circular openings in front, exhibiting, in their turn, the two different directions of a train. On the train being announced from the nearest station, the person in charge at the office presses a stud beneath the opening indicating the direction of the train. The pointsman answers the signal. The points are now set by the manipulator from the central office and simultaneously the lever for the semaphore signal is electrically released, enabling the pointsman to show the line clear.

(2) Intermediary blocking apparatus and speed measurer. The apparatus consists of a clock case containing a clockwork and sector of a dial and two glass covered circular openings above the clock. The train—generally the last carriage—has a small brush attached to a lever which presses the brush against a brass contact piece placed on the line, close to the rail, at the beginning of one section. When contact is made, a red disk appears in one of the openings, and the clock begins to move. At the end of the section a similar contact piece causes another red disk to appear on its respective apparatus, stops the clock movement, and removes the disk of the preceding one. The distance through which the clock hand has moved over the sector indicates the speed of the train. As long as the red disk is exhibited, no train can move in either direction.

(3) Central disk for signaling. On a disk are inscribed different numbers of signals for passenger and goods trains, and a switch-board above the disk exhibits these different numbers on the fall of an annunciator, which is caused by the setting of a contact arm, movable over the disk, on the respective number of the train. All the trains moving on the line are controlled by electric semaphores, which show the line clear only on the appearance of the number of signals characteristic of a special train. As soon as the train has left the section, the official at the station turns the contact arm to the place indicated on the disk for that train; the annunciator of the corresponding numbers on the switch-board falls, and all the semaphores of the section show the line clear.

(4) Apparatus for closing railway gates for foot passengers. The object of the apparatus is the automatic lowering or raising of a gate closing the footpath across a railway gate by a mechanism worked electrically. An electric bell, worked by a signalman at some distance from the gate, informs the foot passengers of the approach of the train; and, by the same operation, the gate is closed electrically by the release of a clock train, which moves a jointed lever arm through an angle of 90 degrees; when the train has passed, the same manipulation opens the gate by completing the movement of the lever arm.

(5) Station indicator. It is no small boon for passengers traveling by express train over long distances to know the name of the nearest station at which the train stops sufficiently long to take a meal, buy a paper, etc. Herr Pollitzer places in every carriage a small box exhibiting in the corner the name of the next station, with time allowed for stoppage. The guard has simply to press the stud of a similar box placed in his van some time before the station is reached, and every box shows the name of the next station, with the time allowed for stoppage. The battery for railway intercommunication, which is rarely used, can be employed for this purpose.—*London Times.*

Extension of American Telegraphic Connections.

To all who are interested in enlarging the commerce of the United States with the nations south of us—in Mexico, Central, and South America—the opening of the extensive telegraphic connections made recently is a matter of the utmost importance. Starting from Galveston, a cable in the Gulf of Mexico connects with Tampico, Vera Cruz, and Coatzacoalcos, on the coast, and thence with 267 miles of land line; crossing the Isthmus of Tehuantepec, the line extends down the Pacific coast as far as Valparaiso, in Chili, stopping at all principal points, making 4,872 lines of cable and 300 miles of land line. From Valparaiso the wires cross the Andes to Buenos Ayres and Montevideo, and thence by cable along the coast connect with the principal points in Brazil. A good proportion of these lines has been opened for business for a considerable time, but were not connected with the American system except as they might be used by telegraphing to Europe and thence back to Brazil, which frequently caused much delay and was very expensive. The cost of telegraphing over these long lines is not small now, being in the neighborhood of three dollars a word for points in the Argentine Republic, Uruguay, and Brazil; but, with the elaborate codes now used, there can be no doubt that our merchants will largely avail themselves of this means of closer connection with their customers in these sections.

The United States is now in direct telegraphic connection with all parts of North and South America and Europe. A direct cable to Australia, Africa, and Asia is now in order, to complete a circuit of the world.

Auxiliary to a Pumping Engine.

At one of the pumping shafts in a lignite mine in Germany an engine was put in for two sets of pressure pumps having 2·5 foot plungers and 7·22 feet stroke, the maximum lift being 236·2 feet. The pumps were driven by the engine through the intermediacy of a bob, without gearing. The engine itself is horizontal, with a 27·9 foot flywheel, weighing 30 tons. It had a 4·59 foot cylinder and 7·22 foot stroke. Its chief peculiarity was, that it was provided with a small special engine, intended to carry the main engine over the dead-center, when running slowly, the crank of the auxiliary engine being placed at right-angles to the main crank. When running without expansion, the engine could be worked at the rate of two revolutions per minute as a minimum, and nine as a maximum, without using the auxiliary engine. When cutting off at three-eighths of the stroke, the number of revolutions per minute could not be carried below five. They were, however, brought down to 3½ strokes by the aid of the auxiliary cylinder, which, by the way, had a diameter of 1·60 feet and a stroke of 3·9 feet. The contrivance in question is, therefore, useful and economical in fuel in those cases where the flow of water is so small that the pumping engine must be run at the lowest speed attainable. The lignite is obtained by stripping, and the quantity of water accumulating during rainy seasons is enormous.

THIS is a calculating age, says a contemporary. Counting is its favorite occupation. It worships figures. Nothing is considered valuable unless it can be counted. Quantity is the test of excellence, and vast numbers command the highest reverence. The popular mind has become insane on the subject of statistics; all our views of life, all our verdicts of success or failure, all our estimates of worth, are based on columns of figures.

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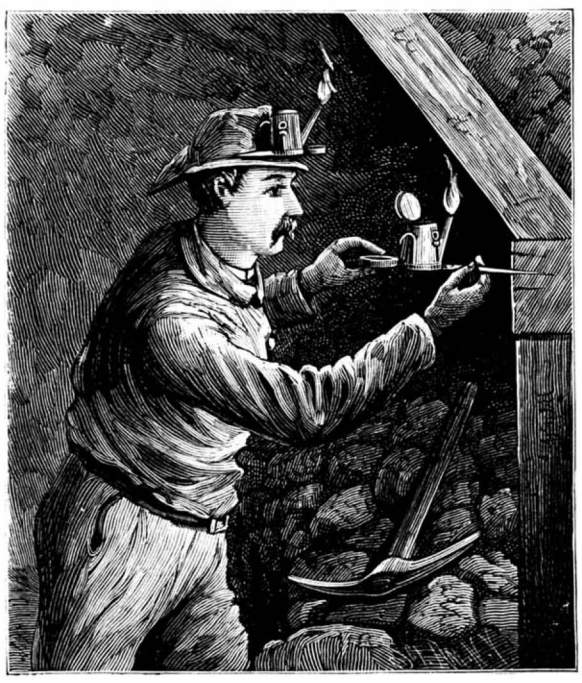
MINER'S LAMP.

A miner's lamp has been invented by Mr. Charles A. Lee, of Silver City, Grant Co., New Mexico, which may be attached to any wooden structure in the mine, to a crevice in the rock, or to the earthen wall, and when attached to the hat or clothing of the miner will not swing nor turn out of proper position. The body of the lamp fits in a ring provided with a handle upon one side and a steel point upon the opposite side, and between the two is a hook by which the lamp may be fastened to the clothing or hat of the miner, or hung upon any projection. A wick adjuster is bent so as to be securely held when inserted in the loop which projects



LEE'S MINER'S LAMP.

from the side of the lamp body. The handle part of the attachment serves as a convenient means of handling the lamp generally, and, in connection with the point, furnishes a broad base for the lamp to rest upon.

Experiments with Steam Whistles.

Messrs. Lloyd & Symes, of Boston, writing to the editor of the *Railroad Gazette*, describe certain interesting experiments which they have carried out. They were made on a locomotive, and with steam varying from 60 pounds to 135 pounds pressure, and most of them with a whistle having a bell $4\frac{15}{16}$ inches diameter, $3\frac{3}{4}$ inches long from lip to head—inside—and an annular steam opening of one-sixteenth inch wide. This whistle, at 60 pounds pressure, gave the sound of E natural, at 80 pounds of F sharp, at 90 pounds of G, at 110 pounds of A, and at 125 pounds to 130 pounds of C sharp in alt. The distance between the steam opening and the edge of the whistle was $1\frac{1}{2}$ inches; when this was raised to 2 inches the power of the sound was sensibly lessened, but its pitch was altered relatively but half a tone. When, on the contrary, it was diminished to 1 inch and to seven-eighths inch, the whistle would sound nothing but its supertones, or "squeal" as the boys call it.

The bell in these experiments was made of cast brass of medium, not a hard character, and the lip or edge carefully chamfered down to a thin edge, set so as to stand exactly over the steam opening. The quality of its sound was very clear, penetrating, and even "reedy," owing to its thin, elastic shape. The power may be estimated by the fact that on a clear, still night it has been heard at Mansfield from Attleboro, a distance of over six miles. They afterward repeated the experiment with a bell of the same dimensions, but made of brass tubing, annealed, hammered, and then heated again, with somewhat the same results, the intensity of the sound and the pitch being somewhat heightened. The next experiment was made with an iron whistle of the same size, which was unsuccessful, the traveling quality of the sound being greatly reduced.

The last trial was made with a whistle $6\frac{1}{4}$ inches diameter, $3\frac{1}{2}$ inches long, and set over an annular opening $5\frac{7}{8}$ inches diameter, blown at a pressure of 150 pounds. The sound given by this whistle was greatly inferior to that of the first one, lacking power and resonance of tone, which they attribute to the size of the bell, which was so much larger than the diameter of the steam opening as to make of it what Professor Henry calls a "resounding cavity." As confirmation of this, they add that they took a bell of the size first named, and cut into it three longitudinal and three perpendicular slits 3 inches long, which had some effect on the character but none on the power of the sound. With regard to the penetration of the sound obtained from the whistle in distinction to other sounds or noises made at the same time, the greatest effect was obtained by "dragging" the whistle, as it is termed; that is, gradually opening and closing the valve, by which means a gradation of five semitones can be obtained, the ear seeming to have peculiar appreciation of this change of relation—as in an organ the effect of power is gained more from the crescendo of the swell than from the full organ itself.

Composition of Different Amalgams.

Arrington amalgam: silver, 40 per cent; tin, 60 per cent. Diamond amalgam: silver, 31·76; tin, 66·74; gold, 1·50. Hood's amalgam: silver, 34·64; tin, 60·37; gold, 2·70; iron, 2·90. Johnsohn & Lund's amalgam: silver, 38 27; tin, 59·58; platinum, 1·34; gold, 0·81. Lawrence's amalgam: silver, 47·87; tin, 33·68; copper, 14·91; gold, 3·54. Moffitt's amalgam: silver, 35·17; tin, 62·01; gold, 2·82. Townsend's amalgam: silver, 40·21; tin, 47·54; copper, 10·65; gold, 1·6. Townsend's improved amalgam: silver, 39·00; tin, 55·65; gold, 5·31. Walker's amalgam: silver, 34·89; tin, 60·01; platinum, 0·96; gold, 4·14.—*Monatsschrift des Vereins deutscher Zahnkuenstler.*

Poisonous Wood.

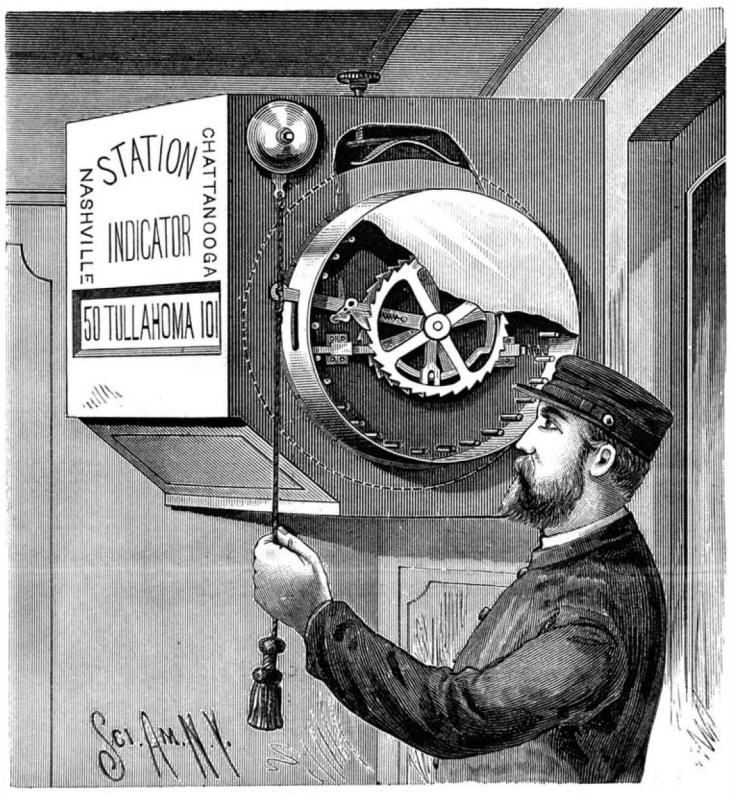
The use of a wood from Panama called cokobola in the manufacturing interests in Bridgeport, is attracting the attention of the Connecticut State Board of Health. The wood is cheap, takes a brilliant polish, is easily worked, and is used extensively for knife handles and ornamentation. Workers in the material are poisoned somewhat after the manner of sumac, although some are free from any defect. Swelling of the face, closing of the eyes, appearances of being burned on the hands, are the usual symptoms. Some are attacked with distress in the stomach, with loss of appetite. One person, who was a confirmed smoker, after being poisoned, has been unable to smoke or even stay in a room where there is any tobacco smoke. Children playing in the sawdust of this wood, which had been dumped, were badly poisoned about their feet. At a large factory on Elm Street, where this wood is extensively worked, chickens in the adjoining yards are said to have all died from eating the dust that settles on the grass.

IMPROVED STATION INDICATOR

A simple and effective device for announcing to passengers on cars and boats the name of the next station or landing, is shown in the annexed engraving. It consists simply of a box containing a revolving drum made of light material, and having printed upon or attached to its face the names of the several stations of the route, arranged in the order in which they occur. There is in the front of the box a window through which the names may be read as they are brought into position by the pawl and ratchet mechanism at the end of the box.

Upon the shaft of the drum are secured two ratchet wheels whose teeth stand in opposite directions, and the pawl lever is provided with two pawls, one for each ratchet wheel. These pawls are attached to a common pivot and are actuated by a single spring. Either pawl may easily be made to act on its own ratchet.

The pawl lever is connected with a registering bolt which is moved whenever the indicator is operated, and projects between pins at the end of the drum limiting the motion of the drum to one step.



PHILLIPS' STATION INDICATOR.

The pawl lever is connected by a cord with the handle by which the indicator is operated. The lever is also connected with a gong, so that whenever the indicator is operated attention will be attracted to it by the striking of the gong.

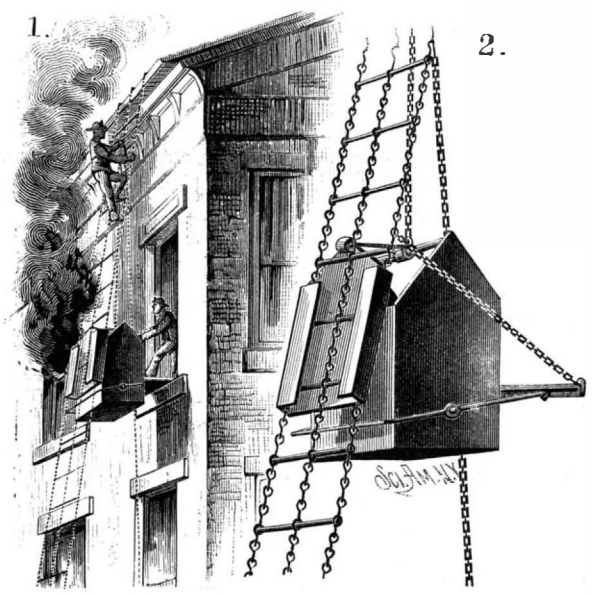
A brake spring is applied to the top of the drum to prevent it from moving too freely. The direction of the rotation of the drum is changed by shifting the pawls at the end of the route. The names of the terminal stations are inscribed at the ends of the box.

This invention has been patented by Mr. I. N. Phillips, of 5 and 7 N. College Street, Nashville, Tenn.

FIRE ESCAPE.

The invention herewith illustrated refers to that class of fire escapes in which a car is guided on stretched cables and suspended by a rope passing over a pulley and down to a windlass. Two or more chains are united by rounds, forming a ladder. One end of the ladder is secured to the roof of the building, or is passed over the roof of the building and held securely on the ground, and the other end is secured to a winch on the ground, by means of which the ladder can be drawn as taut as may be necessary. After the ladder has been drawn taut, a person ascends it and hangs the hook of a pulley on the ladder above the window from which people are to be rescued.

Through the pulley runs a chain, one end of which is



CHRISTIE'S FIRE ESCAPE.

wound about a windlass on the ground, the other end being attached to the car or box. The car is made of sheet iron or wire netting, and on the side toward the house is provided with a downwardly swinging platform, which is held from swinging down too far by chains. A frame pivoted to the ends of the car holds the platform in place after use. A cross bar unites the top of the car with the top of a guide plate whose edges are bent over the side chains of the ladder, thus forming grooves which permit the plate to slide freely up and down the ladder. The chain ladder can be readily moved to any desired window.

Further information can be obtained by addressing the inventor, Mr. Richard Christie, Truro, Nova Scotia.

What Tongue Did Christ Speak?

Some students of this question, which the revision of the Old Testament has beset with renewed interest, are of the opinion that the population of Palestine at the time of Christ's mission was Greek. The Rev. Alexander Roberts, D.D., recently published a book on the Old Testament revision, in which he gives some reasons for this conclusion. For centuries preceding the coming of Christ the Greek language permeated the countries bordering on the Mediterranean. The old Hebrew, in which the law had been written, had become a dead language, and only the learned men of that period were able to read the Pentateuch. The pure Hebrew race in Palestine spoke Aramaic, which was unlike the Hebrew of Moses and Isaiah. The Greek language and Aramaic were, then, the tongues spoken in that country at the time of the coming of our Lord. Hence Dr. Roberts argues that while teaching the people Christ would address them in a language that they understood. Even if he knew the Scriptures in the original Hebrew, he would no more be likely to use them in that way than a modern preacher who knows the New Testament in the original Greek would give his text in that.

The evidence that the common people understood Greek our authority considers conclusive. As examples of facts which led him to this opinion he quotes the epistles which were written in Greek by some of the apostles to the Hebrew Christians. Paul's epistles to the Greeks were, of course, written in Greek. "But," asks Dr. Roberts, "why should Peter, who was a strict Hebrew, write his epistles in Greek unless the Hebrews understood Greek? Why was the Epistle to the Hebrews ascribed to Paul written in Greek?" The apostles appear to have spoken in Aramaic and in Greek, as the occasion seemed to demand. Christ did not address himself merely to a province, but to the world, and his utterances were, therefore, in the language that was best understood. Greek was the language of civilization; moreover, "it was the civilization of that era which accepted him, while the Hebrews rejected him."

THE H. W. Johns Manufacturing Co., New York, have been awarded the silver medal over all competitors at the Amsterdam Exposition for their asbestos materials, liquid paints, roofing, boiler coverings, steam packings, millboard, etc., etc. A substantial victory for American goods

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Chemically Pure.

A writer in the *Chemiker Zeitung* discusses the question of what is understood by chemically pure (C. P.) as follows:

In the smaller chemical manufacturing industries the following degrees of purity are recognized: 1. Technical (commercial). 2. Pure, purified, purum. 3. Chemically pure, purissimum. These terms are used to distinguish different grades of the same article, without, however, referring to any absolute standard of purity. In explanation of this he mentions a few examples:

By technically pure goods are understood such as are obtained by the customary manufacturing methods without any further purification, and are pure enough for most technical purposes; adulterations are, of course, not permissible. Technical (or, as we say in this country, the commercial) caustic ammonia made from gas water must not contain any sulphur, while chlorine contained in the water used is permissible, and so is a trace of tarry matter. Red lead made from ordinary soft lead is *commercially pure*, but if it is mixed with brick dust it is not pure. Chili saltpeter as imported from South America with 95 to 98 per cent of real soda saltpeter is commercially pure.

Under pure, purified, *purum*, we understand such goods as contain no gross impurity. They are generally made from the commercial article. Recrystallized Chili saltpeter is called *pure*, although a slight turbidity is produced in the solution by silver nitrate as well as barium chloride, indicating chlorides and sulphates. Commercial zinc free from arsenic is called *purum*.

The goods designated as chemically pure, *purissimum*, are the purest that are made in that particular factory and kept on sale, although it very rarely happens that they are chemically pure in the strictest sense of the word. Chemically pure ammonia must neither contain chlorine and chlorides, nor yet decolorize the solution of potassium permanganate. The solution of chemically pure soda saltpeter must not give any reaction with silver nitrate or barium chloride. Chemically pure nitric acid must stand the same test. Chemically pure zinc is obtained by distilling what is called pure zinc.

Products that are in fact absolutely pure cannot be afforded at the ordinary price. When such are required, a special bargain must be made. The best way to do when very pure reagents are needed for special purposes is to prepare them yourself. In most cases you can use those of well known makers that are marked C. P. It may happen that in special cases some particular impurity would be objectionable, and in such cases it would be advisable to state this in ordering.

Kahlbaum's Berlin style is highly commendable, of stating on the price list what are the chief impurities.

In this country we may classify many chemical products as follows: Medicinally pure, chemically pure, photographically pure.

For example, potassium bromide for medicinal purposes may contain 1 or 2 per cent of the chloride, and as much carbonate. For chemical purposes the carbonate must be removed and all but a trace of chloride, while in photography even a trace of chloride may prove objectionable. A curious case once fell under our observation, where a quantity of uranium oxide, purchased for chemically pure from a well known manufacturer, was found to contain so much of another and more valuable substance, that the adulterant was of more value than the principal substance.

In all cases where the presence of any particular contamination would be very objectionable, the user should always test for it himself and not trust to another, unless, as sometimes happens, he is not skillful enough to do so.

Black Walnut.

Black walnut can be grown from the nut, producing a butt fourteen inches in diameter in as many years from the the seed, as far north as Massachusetts. No tree valuable for its timber in cabinet uses, unless the black birch be so considered, can attain to that useful growth in that period of time in our northern climate. Maples require twenty years before they become good timber trees; beeches and birches, fifteen years to attain to a diameter large enough to yield nine-inch boards; hickory should have a growth of thirty years; and cherry at least as much.

The cultivation of the black walnut might be made a source of profit, if only as an auxiliary to the ordinary farm products. It requires no particular care, makes an elegant tree even in its youth, and later offers an agreeable shade. The *Sewing Machine Journal* says:

"One hundred acres of land, seeded to walnut trees, if they even reach maturity in fifteen years, would be more remunerative than many of the crops produced by fifteen of incessant toil. Besides, these trees might be planted and would thrive on spots which are really valueless for agricultural purposes, and while in the course of growth would serve as valuable aids to agriculture as wind breaks and in other respects."

CALIFORNIA'S vineyards are rivaling her mines as a source of profit.

AUTOMATIC FREIGHT CAR BRAKE.

Among recent inventions is that of an automatic freight car brake, patented by Mr. William A. Wilde, of Chicago, Ill., which obtains its power by the compression of the draw bar spring. This spring is inclosed in the cast iron box, E (Fig.

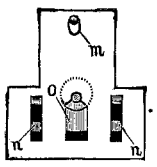

Fig. 2.—LOCK PLATE D.

1), which is provided with a hole in the center of the forward end and with a long slot in the side. On each side of the rear end of the draw bar is a wedge, shown at K. The plate, D (Fig. 2), has a vertical movement within guides fastened to the sides of the cast iron box and to the floor timbers of the

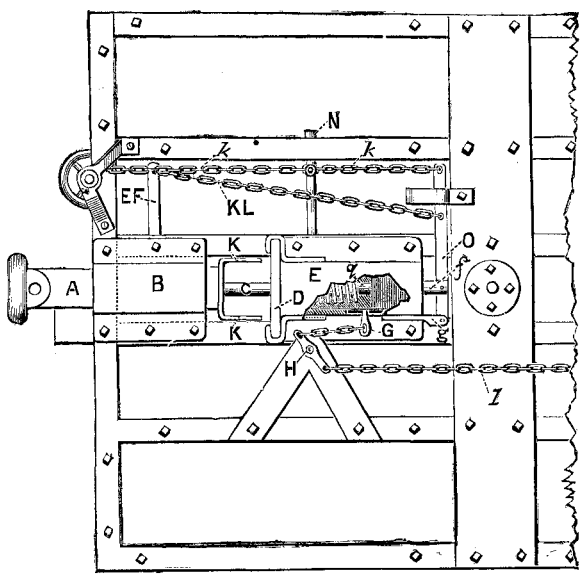

Fig. 1.—PLAN SHOWING BOTTOM OF CAR INVERTED.

car, and is perforated by the rectangular slots, *o n*, near its lower extremity, and with the slot, *m*, near its upper. The draw bar bolt, *c*, passes through the draw bar spring and the slot, *o*, in the plate, and connects the draw bar, A, with the follower *q*, which is connected by the pin, G, passing

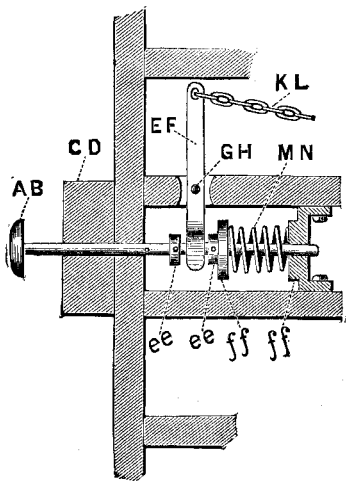

Fig. 3.—REVERSING APPARATUS.

through the slot in the box with the brake chain by means of the lever, H. The bolt, C, Fig. 4, is reduced about one-half its diameter along a small portion of its length, thus forming a recess or neck, as shown at X. The lever, O (Fig. 1), has its fulcrum at *g*, and is provided with a projecting branch, *f*.

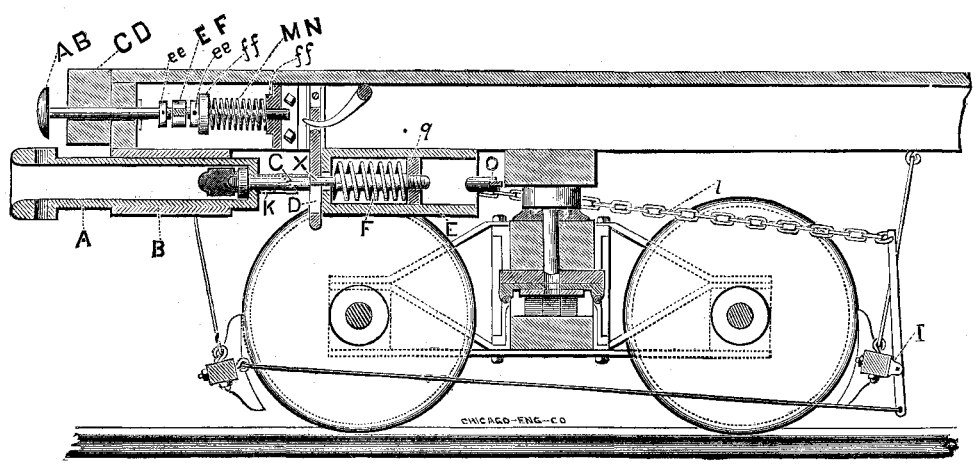

Fig. 4.—VERTICAL SECTION WITH DRAW BAR PULLED OUT.

The operation of the mechanism above described is as follows: When the locomotive moves it pulls the draw bar out and with it the rod, C (Fig. 4), and follower, *q*, thereby compressing the spring, F. This action brings the neck of the rod within the slot, *o*, of the plate, causing the latter to drop of its own weight to find a support in the small end of the slot, thus holding the spring compressed and releasing the brakes, owing to the loosening of the chain, *l* (Fig. 1), by the forward movement of the pin, G. To put on the brakes it is simply necessary for the engineer to put the brake on the locomotive, when the draw bar will be forced in, causing the wedges, K, to enter the slots, *n*, by which the plate is raised and the spring released and the brakes set.

In backing, the reverse bar, A B (Fig. 3), is forced in and carries with it the bifurcated lever, E F, which in turn draws the chain, K L, forward and with it the lever, O (Fig. 1), which forces forward, the follower, *q*, thus loosening the brakes. For use around yards there is provided a device which, by winding up the regular hand brake, first lifts the plate, D, and then draws forward the lever, O, thus throwing the brake off.

Among other advantages the inventor claims that the brake is extremely simple and cheap to construct; that there will be no flat wheels and consequently no returning; that there will be no strain upon the locomotive, as a slight pressure sets the brakes on the first car and they in turn set all the rest; foreign cars do not interfere with its operation; that it will take up its own slack as the shoes wear away; that it steadies the motion of the train; that it will stop runaway cars, as they cannot go far without touching and setting the brakes; that as all brakes are set instantaneously, the train can be stopped as quickly as the locomotive; that when at rest all brakes are set and no effect will be produced by the wind; the engineer can regulate the speed of stopping by drawing ahead as soon as the brakes are set, thereby releasing as many of the forward brakes as he may desire.

Reserve Power a Necessity.

It is not wise to work constantly up to the highest rate of which we are capable. If the engineer of the railroad were to keep the speed of his train up to the highest rate he could attain with his engine, it would soon be used up. If a horse is driven at the top of his speed for any length of time, he is ruined. It is well to try the power, occasionally, of a horse or engine, by putting on all the motion they will bear, but not continuously. All machinists construct their machines so that there will be a reserve force. If the power required is four horse, then they make a six horse power. In this case it works easily and lasts long. A man who has strength enough to do twelve honest hours of labor in twenty-four, and no more, should do but nine or ten hours' work.

The reserve power keeps the body in repair. It rounds out the frame to full proportions. It keeps the mind cheerful, hopeful, happy. The person with no reserve force is always incapable of taking on any more responsibility than he already has. A little exertion puts him out of breath. He cannot increase his work for an hour without danger of explosion. Such are generally pale, dyspeptic, bloodless, nervous, irritable, despondent, gloomy. We all pity them. The great source of power in the individual is the blood. It runs the machinery of life, and upon it depends our health and strength.

A mill on a stream where water is scanty can be worked but a portion of the time. So a man with little good blood can do but little work. The reserve power must be stored up in this fluid. When the reserve power of an individual runs low, it is an indication that a change is necessary, and that it is best to stop expending and go to accumulating, just as the miller does when water gets low in the pond. Such a course would save many a person from physical bankruptcy.—*Herald of Health.*

Liquid for Determining the Specific Gravity of Minerals.

Nearly all natural minerals are heavier than water, and therefore sink in it. But when they are placed in a heavy liquid which does not dissolve them, some sink and others float. If two minerals of unlike gravity occur in the same rock, they can be separated by pulverizing the rock and putting them in a liquid intermediate in weight between both. A new liquid for this purpose has been devised by C. Rohrback, having a density of 3·57. It is an iodide of barium and mercury, and is prepared as follows: 100 parts of iodide of barium and about 130 parts of red iodide of mercury are mixed with about 20 c. c. of distilled water, shaken, and heated on an oil bath to 150° or 200° C. until dissolved, and then concentrated until it will float a crystal of topaz. After standing several days the clear liquid is decanted and filtered. It has a yellow color, boils at 145° C., and refracts light strongly. It can be used for separating axinite, kyanite, in part, epidote, heavy mica, some garnets, and nearly all hornblendes; also jade, olivine, orthite, nearly all members of the pyroxene group, saussurite, titanite, topaz, heavy tourmaline, vesuvianite, and basaltic rocks. In diluting it to obtain any special density, it is mixed with a dilute solution of the same, so as to avoid precipitation. After the separation the powdered minerals are washed with a few drops of iodide of potassium.—*Wiedermann's Annalen.*

SAN FRANCISCO is trying to prevent the landing of lepers from the Sandwich Islands.

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LIFTING BRIDGE FOR DOUBLE TRACK RAILWAY.

The line of the New York, West Shore & Buffalo Railway crosses the Oswego Canal at Syracuse at a point where peculiar local conditions would not admit the use of a pivot bridge. To overcome these difficulties the lifting bridge illustrated on first page was designed; and to freely allow boats to pass, it is lifted to a height amply sufficient to accommodate travel. No delay is occasioned, as the operation of lifting takes but thirty seconds, and the bridge can be so nicely adjusted by means of the counterweights that the work required of the engine is comparatively light. An exact balance is not aimed at, as the bridge when down is disconnected from the lifting machinery, and is held firmly on its seat by a weight of several tons, and the lifting of these few tons is, practically, all that the engine has to do. The location of the road is such that the bridge makes an angle of 38 degrees with the center line of the canal.

The extreme length of the truss is 94 feet, the extreme height 23 feet, and the extreme width 30 feet and 4 inches. Each of the top and bottom chords is composed of two 3 by 3 by ⅜ inch angles, and two vertical plates 12 inches wide and ¾ inch thick, placed 13½ inches between rivets. The top chord is strapped by a lattice on the top, and the bottom chord by a lattice on the bottom. The web of the trusses is composed of angles 2 by 5 by 3½ inches, two being placed parallel but on opposite sides of the chords. In order that the diagonals running in different directions will not interfere with each other, one pair of angles is riveted to the outside of the plate of the chord, and another pair to the inside of the plate. Each pair of angles is latticed. The end posts are the same as the chords, with the addition of a ⅝-inch plate. The floor beams are plate girders 28 inches deep and placed 9 feet 3⅜ inches between centers. The stringers are 12-inch I beams, and upon them rest the ties. The end floor beams are plate girders of the same dimensions as the others, and are placed parallel with the center line of the canal.

The bridge rests upon walls of masonry built upon a solid foundation, and a masonry retaining wall was constructed along the water side of the tow path.

The end columns which carry the pulleys are made of two 15-inch channels, latticed. The back struts for bracing these columns are of two light 15-inch channels, latticed. The tops of the columns are connected by a stiffener, made up of two 8-inch channels on top and two of the same size on the bottom, the web being of 1-inch rods. A similar stiffener connects the tops of the struts.

Each of the counterweights is suspended by two steel wire cables 1¾ inches in diameter, carried over pulleys on top of the columns. The weight is obtained from pig iron and slag put in a wrought iron box having a cast iron yoke extending across the bottom, and to which the ends of the cables are fastened. The other ends of the cables are attached to each end post of the bridge. Attached to each column and freely suspended from its upper bearing is a double threaded steel screw 3½ inches in diameter and 2 inches pitch, and long enough to reach a short distance below the top chord when the bridge is down. To each end post and upper chord of the bridge is riveted a bracket carrying a phosphor-bronze nut through which the steel screw passes. This nut forms the center of a bevel gear, and each one of these gears is actuated by a bevel gear at the ends of two lines of shafts placed on the upper chords of each truss. The shafts are driven by two 8 by 8 inch engines coupled at right angles, one revolution of which gives the nuts a half turn and raises the bridge one inch. When the bridge is lowered, the screws disengage at their upper bearings and allow the bridge to adjust itself to the masonry.

The machinery is located in the center of the top of the bridge.

The bridge is built entirely of iron, and weighs, with the machinery, 146 tons; the counterweights weigh 138 tons. The height of lift from the bridge seat is 10½ feet.

The bridge was designed by Albert Lucius, Engineer of Bridges, New York, West Shore & Buffalo Railway; and was built by the Hilton Bridge Company, of Albany, N. Y., the erection being supervised by H. L. Forte, C.E., New York, West Shore & Buffalo Railway. The machinery was constructed by C. H. Delamater & Co., of this city, after designs by their engineer, H. B. Roelker.

Manufacture of Sorghum Sugar.

The works of the Kansas Sugar Company, at Sterling, Kans., is one of the large and successful concerns in that State. The following account of the process and works of this company, condensed from the Sterling *Bulletin*, will be interesting:

These works are fitted up with $17,000 worth of new machinery. The crusher is located on the main floor of the mill, and is a three-roller machine, each roller measuring 4½ feet by 30 inches, the whole weighing 100,000 pounds, and is driven by a 100 horse power engine. The cane is carried into the mill and fed to the crusher on a carrier, on the endless belt principle, from a point forty feet outside, and the cane after being crushed is carried out on a similar carrier on the other side of the mill in the form of bagasse, where it is spread out to dry, after which it is used for fuel. The steam for running the engine and other machinery, evaporating pans, heating purposes, etc., is generated in a battery of six boilers, 15 feet by 50 inches each, with the aggregate capacity of 350 to 400 horse power.

The juice falls into a large copper pan, 4 by 6 feet, 4 inches deep, whence it runs through a trough into a juice vat below the floor, from which it is pumped by steam into four tanks in the upper story of the mill, which have an aggregate capacity of 6,000 gallons. Each of these tanks has two valves, one to admit, the other to let out, the juice. From these tanks the liquid passes into four defecators of 600 gallons capacity each, at a charge. In these the juice is neutralized with lime, after which it is boiled by ingeniously contrived steam appliances, during which a great portion of the impurities and foreign substances are eliminated by skimming. This process does away with the so-called sorghum taste. From the defecators the material is drawn into four settling pans, of the same capacity as the defecators, where it is allowed to settle, leaving a flocculent precipitant at the bottom, after which the fluid is drawn into another tank, whence it is again pumped by steam into a tank situated above the evaporators, on the second floor, from which it is drawn into the evaporators. These evaporators are made entirely of copper, are 6 feet in diameter and 3 feet in depth. In these the juice is evaporated down to about 20° Baume, which is a comparatively short process. After leaving the evaporators, the semi-sirup, as it is now called, passes through a series of settling tanks to remove whatever of foreign substances may remain, from which it is pumped by a small engine into a tank in the tower. The object of this is to give it height to allow of subsequent filtration, which is accomplished by passing through six bone-charcoal filters 3½ feet in diameter and 12 feet in length. These filters are so connected by pipes and valves as to allow the semi-sirup to run through one or more of them, as required, and thence into the tank beneath the vacuum pan. This vacuum pan, which is situated on the second floor, is 8 feet in diameter, and has a capacity of 2,200 gallons, and will make 15,000 pounds of sugar at a strike, and is capable of making six strikes every 24 hours. The air is exhausted by a Blake combined vacuum and water pump, having a 5-inch suction and 4-inch delivery.

The clarified juice, or semi-sirup, is sucked up from the filter reservoir into this pan, and is evaporated at 120° to 150° Fahr., until the proper number of sugar crystals are obtained, when it is drawn off by a huge gate in the bottom into the crystallizing tanks or wagons. These tanks, eighty in number, are 4 x 5 x 2 feet in size, and mounted on wheels; and, as they receive the contents of the vacuum pan, they are rolled into the crystallizing room and allowed to remain a day or two. This room is 40 x 40 feet in size, with very low and tight ceilings, and is kept at a steady and even temperature of about 100° Fahr., which is done by steam pipes running around the room. This process keeps the sirup in a condition to purge from the sugar.

The material has now assumed a bright, beautiful amber hue, and is designated as malada, or mush sugar. From these tanks the malada is dumped in a huge mixing tank, which is just below the floor of the crystallizing room. The apparatus in this mixer is a long toothed arrangement with a worm motion, which breaks up the lumps, and makes an even mixture. From the mixer the malada is run by small gates into the centrifugals, of which there are four, each 4 feet in diameter. A large, round cast iron box, about a foot from the floor, through the center of which runs a spindle; attached to this spindle is a brass basket, the sides of which are composed of a double casing of woven wire, one coarse, the other fine. The spindle turns these baskets at the rate of 1,400 revolutions per minute. The malada is drawn into the baskets, and the centrifugal force of the fast revolving baskets forces the molasses through the screens and retains the sugar in the basket. A little cone on the spindle at the bottom of the basket is lifted, and the sugar taken out at the bottom in small boxes and immediately barreled. In case the sugar is not to be barreled immediately, it is stored in a room 12 x 12 x 8 feet, on the ground floor.

The molasses (for molasses it is after it has passed through the centrifugals, and the sugar is taken from it) is reboiled in the vacuum pan and then barreled. This article is of a darker hue than if the sugar had not been taken from it, but it is free from the sorghum taste, as is also the sugar.

High Speeds on Railways.

While there can be no doubt that as regards cheapness and rapidity of construction, general excellence of bridges, locomotives, and cars, the railways of this country are ahead of the rest of the world, the signaling arrangements here, with few exceptions, are rudimentary and inefficient, and render fast traveling a matter of considerable difficulty, if not danger. It is impossible to run a really fast express train if the signals are ambiguous, and if every level crossing is made a compulsory stopping place. The saving in time by fast trains can only be fully felt in a great country, where very long journeys are not only possible, but are frequently undertaken; but hitherto this fact has been little appreciated, and people have been content to travel at a slow speed and put up with frequent stoppages because the railways were new, the rails roughly laid, and many bridges unsafe at a high speed. But of late years these conditions have been materially changed. The widespread use of steel rails, the greater care bestowed on the roadbed, and the introduction of iron bridges of first-class workmanship, have rendered high speed perfectly safe and easy on most parts of good roads in the Eastern and Middle States; but it is rendered unsafe where switches are so arranged that they may be left open to an approaching train without any signal warning the engineer, or the signals are so formed that the difference to the eye between a clear or all-right signal and a danger or stop signal is slight in snowy weather, or under certain atmospheric conditions which render the difference between colors imperceptible, though a difference in form may be perceived.

The real gain of time to a business man obtained by a difference of a few miles an hour in the speed of a long-journey train is best illustrated by an actual case. A man in New York wishes to do a day's work in Chicago. He takes one of the fastest and best appointed trains he can find—the Chicago limited. It leaves New York at 9 A.M., and lands him at Chicago at 11 the next morning, having accomplished 911 miles in 26 hours 55 minutes, allowing for the difference in time between the two cities. This makes an average speed of 33·8 miles per hour, including all stoppages. But assume, what is surely not extravagant, that as high a speed can be attained on the Pennsylvania or any other first-class American road as on an English main line, and what shape does the problem assume? On one English road, the Great Northern, the distance between Leeds and London (186¾ miles) is done in 3 hours 45 minutes, including five stoppages; on another, the Great Western, the 129¾ miles between Birmingham and London is run in 2 hours 45 minutes, including two stoppages; and as neither of these routes is particularly level or straight, and both pass through numerous junctions with a perfect maze of switches and frogs, they give a fair idea of what is possible in speed on the railroads of this country. These figures give, respectively, speeds of 49·8 and 47·2 miles per hour. Taking as a fair average 48 miles an hour, including stoppages, the journey from New York to Chicago should be done in 18 hours 59 minutes, or say 19 hours—a saving of 7 hours 55 minutes on the present time; so that, if the train were arranged to leave at 55 minutes past 4 in the afternoon, instead of 9 o'clock in the forenoon, the whole of this time would be saved in the busy part of the day; effectually adding a day to our imaginary traveler's business and dollar-making life.

It may be thought that such a deduction is unfair, as the English style of car is so much lighter than the American; but, as a matter of fact, the average English express train is considerably heavier than the Chicago limited, and conveys about three times the number of passengers; and, as trucks and oil-lubricated axle boxes are not yet universal there, the tractive resistance per ton is probably higher. It certainly, therefore, seems not only possible, but feasible, to attain these high speeds in this country, where, owing to the long distances to be traveled, they are more valuable than in England; and the great step toward attaining that end is the adoption of proper and efficient signaling arrangements. All the other steps are achieved; the American passenger locomotive of the present day is perfectly competent to drag a heavy train at a speed of over 60 miles an hour; the cars, as now constructed, can travel safely and smoothly at that speed; and the steel rail, the well ballasted tie, and perfect workmanship of the modern iron bridge can well support the thundering concussion of an express train at full speed. But this speed can only be maintained for a few miles at a time, if the engineer who guides this train be doubtful whether the dimly-seen signals imply safety or danger, or if the laws of the State bring him to a full stand where his road is crossed by a small corporation with a high sounding title, which owns one locomotive with a split tube sheet and two cars down a ditch.

To run a fast train, a clear, uninterrupted road is absolutely necessary; and the reason is not far to seek. To move a body from a state of rest to a velocity of 60 miles per hour, or 88 feet per second, an amount of work must be performed equivalent to lifting that body 121 feet. Now, it is apparent to the simplest capacity that it requires a pretty powerful engine to overcome the resistance of a train running at 60 miles per hour without every few miles putting on brakes to destroy this velocity, and then to lift it 121 feet again to attain speed; the resistance of the air, and the friction of bearings on journals, and of flanges against rails going on all the time. As a matter of fact, showing what severe work this is on an engine, the Zulu express on the Great Western Railway of England, which is the fastest train in the world, has been repeatedly carefully timed; and it is found that, though running over an almost absolutely level and straight road, it takes a distance of 26 to 28 miles to attain its full speed, about 58½ miles an hour.—*Science.*

Alleged Lack of Technical Education among American Machinists.

The Philadelphia *Ledger* says that a person who recently advertised for machinists tested the proficiency of all who applied, and remarked, when summing up the qualifications of the men, that, though the American pleased him the most by their brightness, the foreign workmen were, without exception, better educated. The Americans had picked up their trades in the shops, but most of the foreigners, in addition to their shop practice, had attended technical schools. The latter could not only do good work with the tools, but they could lay it out, make sketches, and, if necessary, draw the designs to scale. The American shop-taught workmen, though quick to understand, inventive, and skilled in the use of tools, were markedly deficient in drawing and such knowledge of mechanics as is required by the designer and draughtsmen.

Perhaps there is some truth in the above; but so long as American machinists continue to maintain their supremacy for superior ingenuity, excellence of work, and greater rapidity in its execution, they can afford to spend less time on the minutiæ of the schools. In some cases, where ignorance is bliss, 'tis folly to be wise.

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Correspondence.

Carelessness of our Railroads.

To the Editor of the Scientific American:

Your article on "Automatic Safety Appliances" (September 29) struck me as being very timely and suggestive, especially so in regard to railway appliances, the air brake in particular. I have been surprised to see the number of accidents that have occurred in the past year from the failure of the air brake to work at critical times, involving a great loss of life and destruction of property. My attention has been called to these accidents in particular, because I think that most of these accidents could be avoided if the railroads of the country showed more enterprise and examined the different safety appliances that are offered for their consideration. But I know from personal experience that it is of no use to try to get a hearing from the prominent railroad companies of the country, the almost invariable reply being, "We have adopted a standard brake and coupler;" and instead of encouraging the inventor, do all in their power to discourage and keep him in the background.

It seems to me that no relief can be expected from the railroad companies until a little more desire for safety is exhibited and less desire t run their roads at the least possible cost. My opinion is that it should be part of the duties of the Railroad Commissioners (appointed by the State) to examine and test (when in their judgment the merit of the invention calls for it) the different railroad appliances submitted to them and report as to their merit, and recommend the adoption of those that would best insure the safety of life and property. I think that they could not better serve the State and the public at large than by giving attention to these important matters.

GEORGE F. BOND.

The Power of a Locomotive under Full Headway.

To the Editor of the Scientific American:

Thinking the following might be of interest from its peculiar nature, I send you particulars: About five o'clock on the afternoon of the 8th inst., while a construction train on the Lowell branch of the Boston and Maine Railroad was backing down on the main track, it was struck in the rear by an approaching train, demolishing two cars. In the excitement of the moment the engineer of the construction train opened the throttle of his engine instead of closing it, and both men jumped off. Under the extra pressure of steam the locomotive broke the connection with the train and started alone for Lowell.

Meeting with no obstruction on the way, it plunged into the depot at a rate of speed estimated at 60 miles an hour. The first obstacle encountered was the heavy bunter at the end of the track, which was torn up and lodged on the cow-catcher; it next tore up the planking and beams of the floor and demolished one end of the baggage house; it next encountered a brick partition about 18 inches thick, which was scattered in all directions; after passing through this wall it traversed the length of the U. S. and C. express office, and struck the outside wall of the depot, abutting on Central Street, with such force as to drive the bunter which had lodged on the cow catcher, clear through a solid granite rock a foot in thickness, making a hole about 15 inches in diameter. This put a stop to its progress in that direction, and as the floor was not strong enough to longer hold the weight, the whole mass broke through into the cellar, where it came to a standstill. A bystander had the presence of mind to make his way into the steaming mass of ruin and allow the steam to escape, and thus possibly prevent an explosion. The entire floor of the express office was broken away, and a large quantity of express matter destroyed. The only serious accident was that of an old lady of 70, who was in the express office at the time. She was so severely injured that she died in about two hours. It went about 100 feet after leaving the rails before coming to a standstill.

The principal blame is attached to the engineer for remaining on the main track when the other train was due, and also for leaving his engine after opening the throttle.

B.

Lowell, Mass., Oct. 10, 1883.

An Unsolicited Testimonial.

In the issue of the SCIENTIFIC AMERICAN of September 8, 1883, appeared an illustrated article describing a new motor for light work—the production of the Economic Motor Company, of this city. Under date of October 12, scarcely more than a month from the publication of the original article, the manager of the company sends the following:

"EDITOR SCIENTIFIC AMERICAN: DEAR SIR:

"It may be of interest alike to you and your readers to know that the notice published in your issue of September 8, regarding the new gas motor of this company, resulted in about 850 letters of inquiry from all parts of the United States and from Europe, besides innumerable personal applications."

Such an unsolicited letter it is perfectly legitimate to publish. If it means anything, it means that the SCIENTIFIC AMERICAN, with its enormous circulation at home and abroad, is an economic means for the introduction of new inventions and improved machinery to the public. It also implies that, as an advertising medium, it cannot be equaled.

Inventors and Inventions.

The New York *Sun* not long ago, in an article on some of the queer happenings in the world of discovery, said what is undisputably true, and that is, the number of successful inventors is always large, but the number of unsuccessful ones is very much larger. There is always somebody working at the insoluble problem of perpetual motion or making a flying machine. It not infrequently happens that, after a patent has been refused to an inventor, a subsequent application is granted by a different examiner.

It sometimes happens that a patent is granted to one man after somebody else has failed to receive a patent for the same invention. This is a fruitful source of litigation. Indeed, litigation about patent rights is so common that in the introduction of any valuable patent the legal expenses of defending it are a large part of the capital required. Immense sums were spent in defending Morse's patents for telegraphing, and the various patents for sewing machines, India rubber manufacture, and of the inventions that have revolutionized industrial processes. But, when rights are once established by law, the profits are enormous. It was shown in a recent case before the United States Court that for royalties alone on the manufacture of barbed fence wire more than $1,000,000 a year were paid.

Inventors are now chiefly busy with electricity, and the Patent Office is deluged with devices for making new uses of the modern marvel, or for using it with new appliances. Many of these inventions run in the direction of motors. The opinion has gained some ground lately that storage batteries of electricity are not as successful as was at first expected. It is asserted by some that no storage battery every gives out as much electricity as it receives, and that every moment decreases the amount yielded. Edison says the best storage battery is a ton of coal, which can be used at any time to drive a dynamo machine. Others, however, still think that the storage battery will produce wonderful results.

Inventors have always sought to utilize the forces of nature for the conservation of power. A good deal of time and money has been spent on efforts to utilize the force of the rise and fall of the tide. According to some plans, the water is to be stored in a reservoir at high tide, and used to turn a water wheel when the tide falls. Another plan is to get the power from the rise and fall of a float. There used to be a tidal mill at Astoria and another at Charleston, S. C. The large amount of land required to get the requisite area of water surface is considered an insuperable objection to tidal mills.

A good deal of money has been expended on solar engines, in the hope of getting power out the sun's rays. John Ericsson, the inventor of the Monitor and a thousand other things, has made some beautiful solar engines, and not long ago an inventor had a model of a solar engine on the top of the Cooper Union building, and managed to get up steam in a boiler. The trouble is, however, that the sun does not always shine, and the solar engine, to be of any practical use, must be accompanied with a storage reservoir of power that can be kept for a rainy day.

There is no telling of what great value the discovery of the simplest fact may be. When bromine was discovered by Ballard in 1824, nothing of importance was expected from it. Now it is a valuable factor in photography, and a useful remedy for nervous affections.

Capital is never wanted to try even the most foolish inventions. Not long ago an inventor had an idea that he could, by the use of a naked wire, produce a return current and avoid electrical disturbances in cables. He could have got the capital to lay a long cable under ground to try his experiment. He was with difficulty dissuaded from doing this by a practical man, who saved him lots of money by wrapping several miles of cable about a barrel and arranging the naked wire as proposed by the inventor. The result was a complete failure, but the cost of the experiment was comparatively trifling. This is an illustration of the large amount of money that can be wasted through ignorance. Men will work away at an idea with no knowledge of what has been done or what can be done, only to discover at the end what they should have known at the beginning.

A good deal of money has been spent in the effort to introduce ice machines. There is, however, a strong competition to be encountered, since ice may always be had for the gathering, and transportation is cheap.

Fire escapes are numbered by the thousand. Hardly a day passes that the Fire Commissioners are not compelled to test some new plan. A good deal of room is taken up in the Patent Office with the models of these contrivances.

A very good example of the eagerness with which capital can be secured to promote the most chimerical ideas may be seen in the story of the Keely motor. The stock holders have been pretty thoroughly bled already, but are compelled to bleed still more in the hope of saving what they have already expended. The varying fate of capital invested is seen in the contrasting results of the two steam heating companies in New York city, one of which has proved a most lamentable failure, while the other has had a measure of success. It is not so certain that money invested under ground will always return a fair interest. It may be necessary to incur great expense when an under ground cable gives out, as the whole route may have to be dug up to find the break.

Accidental discoveries have supplied some of the most valuable processes of the industrial arts. It is said that the rolling of cold iron was first suggested by the fact that a workman who was placing a piece of hot iron in the rolls carelessly permitted his tongs to be drawn in. He noticed that they were rolled, and not broken. He called the attention of the superintendent to the occurrence, and this led to investigation and experiment and the discovery that cold rolled iron is equal to steel for shafting purposes. The process of rolling iron cold was not long afterward patented, and millions of dollars have been made out of the patent.

There are many similar instances where observing workmen have called attention to valuable processes. A signal one was in the early period of the cotton manufacture, when a good deal of trouble was caused by the cotton sticking to the bobbins. All the workmen in the mill were delayed by the necessity of stopping work to clean the bobbins. At last one workman found a way to obviate the trouble. He, and he alone in all the mill, had clean bobbins. For a long time he kept his secret to himself. He finally revealed it on the promise of a pint of beer a day for life. His secret was to "chalk the bobbins." That little scraping of chalk on the bobbins saved millions of dollars a year, and the observing workman got not only his beer but a competence. Each extension of modern enterprise and skill brings with it a train of inventions. The railway, the telegraph, the steamboat, the development of iron, electricity, and petroleum, have each produced a long line of inventors more or less successful, so that each of these industries might have a creditable exhibition by itself.

Wrought Iron Struts.

At a recent meeting of the American Society of Civil Engineers in this city, a paper by Mr. James Christie, M. Am. Soc. C. E., on "Experiments on the Strength of Wrought Iron Struts" was read. These experiments were made at the Pencoyd Iron Works for the purpose of determining the comparative resistances to compression of long and short struts, rolled angles, tees, beams, and channel sections. The specimens were tested by four different methods, viz., with flat ends between parallel plates to which the specimen was in no way connected; with fixed ends or ends rigidly clamped to parallel plates, the plates substantially forming flanges to the specimen; with hinged ends, or both ends fitted to hemispherical balls and sockets or cylindrical pins; with round ends, or both ends fitted to balls resting on flat plates. The specimens varied in length from six inches up to 16 feet, and were selected to obtain a uniform character of material. The paper gives tabulated results of 299 experiments, and these results are illustrated by a number of diagrams. There were also results given of a number of tests of welded tubes. The general conclusions drawn from these experiments were as follows ($\frac{l}{r}$ being length divided by least radius of gyration):

When struts are short, say $\frac{l}{r}$ below 20, there will be no practical difference in the strength of the four classes, so long as reasonable care is taken to keep the center of pressure in the center of the strut. Hinged ended struts vary all the way from round ended up to flat ended in strength. If the hinges are pins of substantial diameter, well fitted, and exactly coincident with the axis of greatest resistance of the strut, the strength of the strut will be fully equal to that of a flat ended; but considering the impracticability of maintaining this rigid accuracy, the average hinged struts as compared with flat ended will fall in strength as the length is increased until $\frac{l}{r}$ is about 250, when they will average one-third less resistance than flat ended. From this point they will gain comparatively until $\frac{l}{r}$ becomes about 500, when both classes will be practically equal. Fixed ended struts gain in comparative resistance, from the shortest lengths upwards, until $\frac{l}{r}$ becomes about 500, when they are twice as strong as either the flat or hinged ended.

Round ended struts continually lose in comparative resistance as the length is increased. When $\frac{l}{r}$ is about 340, they will be half as strong as hinged ended, and when $\frac{l}{r}$ is about 160, they will have only half the strength of flat ended.

The iron from which the tests were made exhibited the following resistances to direct compression, being the general results of several tests of small section, fifteen inches long, and secured in such a manner as to prevent lateral flexure.

With 30,000 pounds pressure per square inch, incipient permanent reduction of length was observed.

With 35,000 pounds pressure per square inch, failure of elasticity occurred, and marked permanent reduction of length.

With 50,000 pounds per square inch, a permanent reduction of length of three per cent occurred.

With 75,000 pounds, a permanent reduction of ten per cent; and with 100,000 pounds pressure per square inch, a permanent reduction of twenty-eight per cent of the length.

AT Chester, Illinois, diggers in a clay bank unearthed, September 20, a number of fossilized remains, among which was the tusk of a mastodon, five feet six inches long, and at its root measuring eight inches in diameter. The skull was also found, but was too much decayed to be removed entire.

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Ready Made Houses.

We have before referred to the large business carried on in some sections of the country by the manufacturing of ready made houses. A correspondent of the *Old Colony Memorial* paid a visit not long ago to Fairfield, Me., where a large establishment is located for the production of these knock down houses, and he says that few have any idea to what extent this business has been carried in Waterville and its neighborhood, or to what perfection it has been brought. In the establishment to which we refer dwelling houses are made, like boots and shoes, in any quantity, and of any size or style, and for any market in the wide world. Not long since this concern received a single order for fifty houses for Cape May, to be delivered speedily and in complete finish.

These houses were to be, not sheds nor shanties, but regularly ordered dwellings; and they were made accordingly and so delivered, and contain hundreds of occupants at this moment. An order will be received for a $50,000 hotel, or an ornate, French roof cottage, for a fine country estate, and these as easily and expeditiously furnished as an ordinary boarding house for a country village, or a barn for a ranch in Kansas or Colorado. Do not suppose that only a coarse, rough frame is thus sent out, to be trimmed into shape on the spot where it is delivered! On the contrary, the house is complete when it leaves the factory, and as ready to go together as is a musket when it leaves the armory at Springfield, all the parts being found, even to the knobs for the doors, and the screens and shades for the doors and windows, according to specifications. Great trains of freight cars stand waiting about, and are freighted almost daily here. The refuse trimmings and edge cuttings of the lumber are carted off to a neighboring pulp mill, and there speedily turned into material for paper or other products. Machinery for almost every conceivable use in connection with wood is at hand, and house materials, of any kind or size or shape, seem to drop out like meal from a hopper. In a recent instance, where a large building was furnished for a Southern order, the parts were thus made, and when put together in the city where the building is now standing the length of the latter was found to vary not the eighth of an inch from the original specifications, although its length on the front numbered hundreds of feet. Every inch of this building, from the sill to the last shingle, was sent ready prepared from this factory, and "set up" as readily and almost as quickly as a nail cask.

Alaskan Mummies.

Four Alaskan mummies were brought down from Alaska by the schooner Kodiak, on her last trip. Three go to Berlin and one to the Smithsonian Institution. The bodies are wonderfully preserved, even the skins in which they are wrapped being intact. One mummy, evidently that of a woman, is now in possession of the Alaska Fur Company, and is in a state of almost perfect preservation.

The mummies were secured by A. Jacobson, who has been over two years in the country collecting for the Royal Museum of Berlin. He is of the opinion that the mummies are at least 200 years old, all evidence obtainable pointing to that fact. The Esquimaux formerly preserved the bodies of their dead shammans, or medicine men, and those of their chiefs and their wives and their children, in this manner. After death the viscera were removed from the interior of the body through the pelvis, and the limbs being pressed close to the body, the legs well up under the chin, were dried and incased in skins, and then placed in some cave or rock shelter which was free from water or moisture. Here they remained for hundreds of years, and were reverenced by the living. To them were offered part of the results of their fishing and hunting excursions, if they were successful, for they judged success to be due to the spirits of those whose bodies were preserved. The mummies just brought down are in a wonderful state of preservation, considering the rude means employed. In the case of one that has been opened, the skin appears to remain intact, and the limbs are movable.—*San Francisco Bulletin.*

On the New York, New Haven, and Hartford Railroad one of the tests exacted from candidates for passenger train brakemen is the ability to make a distinct announcement to passengers of the names of the several stations. On most of the railways it seems impossible for the average brakeman to speak plainly. Any sort of jabber that happens to come into his mouth he considers to be just as good as the mention of the real name of the station.

SCIENCE IN ANTIQUITY.—CURIO'S PIVOTED THEATERS.

Pliny states (lib. xxxvi., cap. 15) that toward the year 700 of the founding of Rome, that is to say, a half century before Christ, a very wealthy Roman citizen was desirous of giving, on the occasion of the funeral obsequies of his father, plays that should surpass all those that had been witnessed up to that time. This was a difficult thing to do, since, a short time before, Scaurus, the son-in-law of Scylla, and the possessor of a vast fortune derived from the effects of those who had been proscribed, had had constructed, while he was

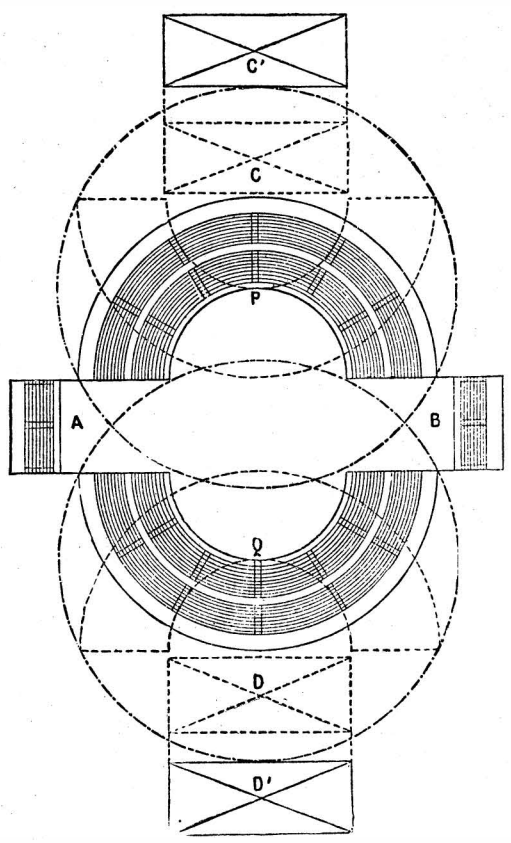

Fig. 2.—PLAN OF CURIO'S PIVOTED THEATER.

edile, a theater capable of holding 80,000 persons. The stage of this theater was ornamented with 360 columns, distributed in three superposed rows. Those of the lower row were of marble, and were 12 meters in height; those of the upper were of gilded wood, and those of the intermediate row were of glass. Between these various columns there were, in all, 3,000 statues.

Curio, not being able to hope to do anything more magnificent, says Pliny, was obliged to substitute ingenuity for extravagance. He therefore had constructed two very large wooden theaters quite near to one another, and each so exactly balanced upon a pivot that it could be revolved. In the morning plays were put upon the stages of each of these theaters, the latter then being placed back to back, so that the noise from one could not be heard in the other. In the afternoon, a few boards having been removed, the two theaters were all at once revolved so as to make them face each other, the magistrates and the Roman people being carried along with them. It was then only necessary to connect the corners of the two theaters in order to have an amphitheater in which gladiatorial combats might be exhibited. Which should be most admired here, the inventor or the thing invented? He who was bold enough to project the thing, or he who was rash enough to put it into execution? What is most astonishing is the foolhardiness of the Roman people, which was sufficiently great to allow them to seat themselves in so movable and unstable a machine. These people, the conquerers and masters of the entire world, who, after the example of the gods whose image they were, disposed of kingdoms and nations, were here suspended in a machine applauding the danger by which they were menaced.

On the last day Curio was obliged to change the order of his magnificent entertainments, since the pivots became strained and out of true. The amphitheater form was therefore preserved. Having placed the stages back to back across the whole diameter of the amphitheater, he exhibited combats between athletes, and then all at once removing the stages, he caused all those of his gladiators who had been crowned during the preceding days to appear in the arena.

The mode in which these theaters were constructed has occupied the attention of several learned persons. Cardan, in his book "De Subtilitate;" Barbaro, in his "Commentaire sur Vitruve;" and the Marquis Maffei, in his "Verona Illustrata," have had a few words to say about them; but the most plausible and the clearest explanation is the one given by Count Caylus in vol. xxiii. of the "Histoire de l'Académie des Inscriptions et Belles-Lettres" (1756).

I shall first observe here, with Count Caylus, that architects had still the habit at this epoch of building wooden theaters, since the first stone one was erected at Rome by Pompey; and then I shall recall the fact that Pliny wrote his history about one hundred and fifty years after the event, so that we need not accept anything but the principal data of his narrative, and may perhaps regard the circular voyage of the Roman people as a simple oratorical embellishment.

We know that such Roman theaters as were designed for the representation of tragedy or comedy, as well as for athletic spectacles, consisted essentially of three parts—the *cavea*, the *orchestra*, and the *stage*.

The *cavea* consisted of a series of seats raised above one another and forming concentric semicircles in which the spectators were seated. The upper tier, which was much the widest, formed a covered promenade. The *stage* was a parallelogram raised above the ground and placed against the diameter that limited the cavea.

Finally, the *orchestra* was the part which was situated on a level with the ground, and which extended between the stage and the cavea. It was here that the authorities were placed.

As for the amphitheaters that were designed for gladiatorial combats, these were formed of a series of oval tiers of seats inclosing the arena.

It will be seen that the transformation due to Curio's imagination might have been effected, as Pliny indicates, by a rotation, around the pivots, P and Q, of the two caveas whose framework rested upon a series a small wheels (Fig. 1) movable in circular tracks that were probably of metal like the wheels themselves. The stages, C and D (Fig. 2), of the two theaters, which were constructed of light framework, could be taken down and pushed back at C' and D', and allow the two theaters to revolve on their axes so as to come face to face, while leaving between them only the space necessary for the rotary motion. This space was then filled with light and movable pieces of framework, A and B, that formed on the ground floor vast doors for the entrance of the gladiators, and, in the story above, boxes for the Roman magistrates, who, whatever Pliny has said about it, must have been obliged to leave their orchestra stalls during the maneuver.—*La Nature.*

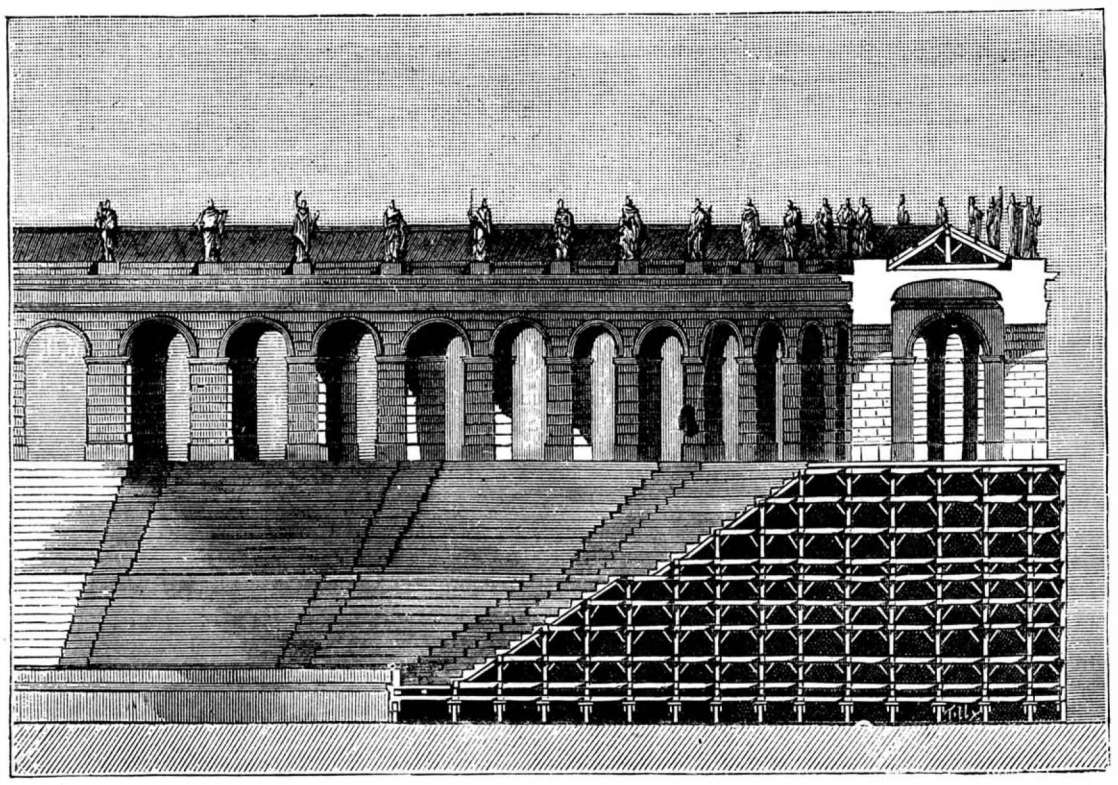

Fig. 1.—SECTION OF CURIO'S PIVOTED THEATER.

Early History of the Air Pump.

If it is difficult to decide who invented the telephone, one of the most recent inventions, how much more difficult it must be to ascertain the date of the discovery of the air pump more than two centuries ago. Gerlandt contributes a paper on this subject to Wiedermann's *Annalen*, in which he says that only this much can be established with certainty in regard to the date of its discovery, namely, that it was prior to the middle of August, 1652. Boyle invented the transparent receiver with movable cover; Huyghens, the air pump plate; Huyghens and Papin, the barometer test (manometer for low pressure); Papin, the doubly perforated cock, the use of two barrels, and the valves; but the latter were also used by Sturm.

FRECKLES can be removed, according to Dr. J. V. Shoemaker, by the careful application of a little ointment of the oleate of copper at bed-time. He makes the ointment by dissolving the oleate of copper in sufficient oleo-palmitic acid to make a mass.

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Salmon Canning in Oregon.

Astoria, at the mouth of the Columbia River, Oregon, was founded by John Jacob Astor as a fur trading post in 1811, and his enterprise, at that day and for many years afterward unique, was celebrated in a volume written by Washington Irving. The location has become the great salmon canning depot of the Pacific coast. The business was begun in 1867, and in the first year 1,000 one pound can cases, containing 48 cans each, were put up for the market. Now, according to a correspondent of the New York *Times*, there was sent east last season 282,000 cases of salmon, which is expected to be increased next year to 300,000 cases, making 11,200 tons, or 1,000 car loads to be sent over the newly opened Northern Pacific Railroad. During the last season 153,600 tons of salmon were packed at Astoria, the larger portion of which went to San Francisco, from thence to be sent to all quarters of the globe, about two-thirds of the total catch going to Europe.

There are thirty-seven canneries in Astoria, employing about 4,000 men to man 2,000 boats, and as many more to dress and can the fish. Chinese are the canners, and Italians, Greeks, and Scandinavians the fishermen. The average weight of the live salmon is 32 pounds each, although fish weighing as high as 80 pounds have been caught. The dressed fish weighs just about one-half less than it does when caught. The "handling" of the fish is an art. The "slitter" has a row of fish ranged on a table with the tails toward him. He walks along the table, and with a rapid movement cutting off tails and fins as he moves. Then the fish are reversed, and with equal celerity he chops off each head with a single motion. Then he slits the fish open and removes the entrails. The dressed fish are cut into slices by revolving knives, and by a compressing machine are packed into cans. A can of salmon is cooked in superheated steam long enough to cause the complete disappearance of the bones, otherwise the contents would spoil.

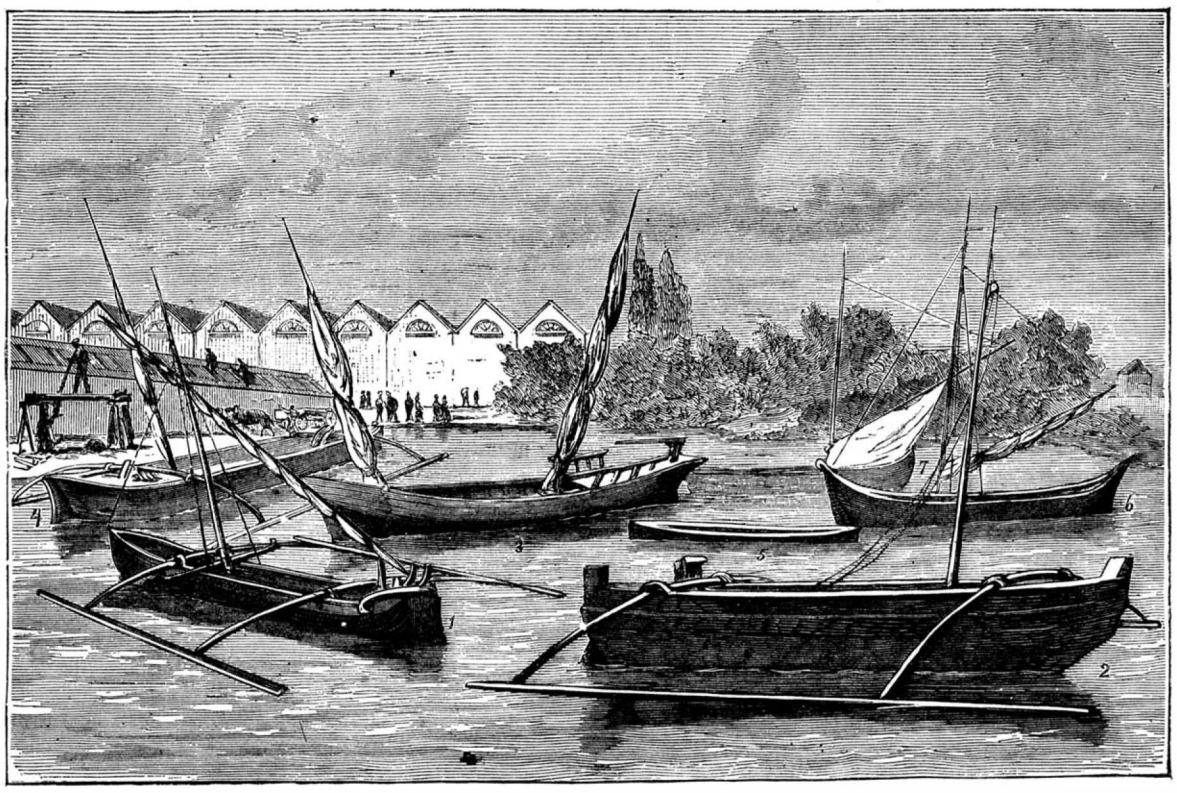
A Cause of Typhoid Fever.

The theory that the emanations from obstructed foul drains conveying decaying vegetable matter or human excretæ is provocative of typhoid diseases, appears to accumulate testimony; and therefore that these drains should always be kept free and occasionally washed or "flushed" would seem to follow. The sanitary superintendent to the Board of Health of New York city has recently reported that an increase of typhoid cases might be expected, one of the reasons for the report being the restricted supply of the Croton water for cleansing purposes. The gist of the report on this subject is the requirement of an abundance of clean water for flushing all water closets, soil pipes, and drains. Dr. John C. Peters says that typhoid fever is caused largely by broken, overfilled, or otherwise defective drains, the latter of which are common in the country, and there typhoid fever is more common, in proportion to the number of inhabitants, in small towns and villages, and even isolated farm houses, than in large, well sewered cities with an abundant water supply. Typhoid fever is largely imported into New York and other cities every fall by visitors returning from so-called health resorts and summer boarding houses, but it generally dies out in the city. This year, however, partly because of the drought, we have not had sufficient water to flush our drains, soil pipes, and sewers.

FOREIGN capitalists have just bought a large tract of timber land in southeastern Arkansas, said to contain 460,000,000 feet of timber.

JAVANESE BOATS AT THE INTERNATIONAL COLONIAL EXHIBITION AT AMSTERDAM.

The industries of the Javanese are in a comparatively high state of perfection. Their arms, chased and inlaid swords, or "kris," their beautiful jewelry and fine works in silver filigree, carvings in ivory and ebony, fabrics, etc., are all made with very good taste, very strong and durable, and with the most primitive means. The Javanese are also very expert in building ships, although surpassed in this branch of industry by their neighbors, the Malays. In the exhibition there are hundreds of models of their ships, from the Sultan's ship of state to the Chinese proa, thousands of which annually cross the ocean between Canton and Batavia.



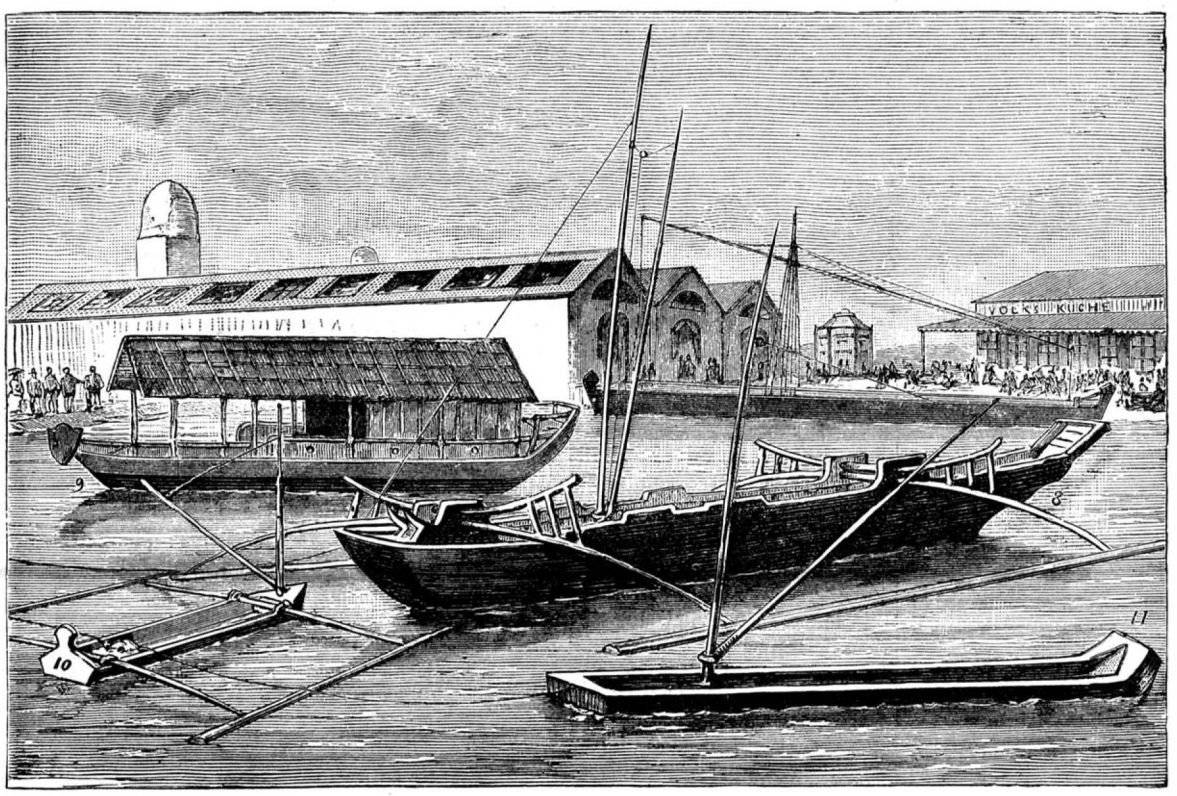
JAVANESE BOATS AT THE INTERNATIONAL COLONIAL EXHIBITION AT AMSTERDAM.

In the annexed cuts we have shown the principal forms and shapes of the vessels used along the coast. Not only the models are exhibited at Amsterdam, but also full size vessels, which are sailed on the canal flowing through the exhibition grounds.

The vessel marked 1 in the upper cut shows a proa from Makassar, on the island of Celebes. Vessels of this kind have room for two men only, but are used in traffic between the island of Celebes and Java, and remain out at sea for several days. This vessel, as well as those marked 4 and 5, is provided with means for preventing its capsizing. A transverse bamboo rod, or other piece of wood, extends over the vessel at each end and projects from its sides, and to the ends of the said transverse rods longitudinal rods are fastened in the manner shown. This frame prevents the capsizing of the vessel even in the greatest storms; but at the same time the boat offers greater resistance to the waves which dash over it with much force, and thus the danger of being washed overboard from these vessels is increased. Furthermore, it is very difficult to steer vessels provided with this contrivance, and they require much space in harbors. If this safety device were constructed with hinges, so that it could be raised in the harbors, some of the difficulties would certainly be removed and the advantages still retained.

There is a good chance for an inventor to provide some ingenious contrivance by means of which these frames can be used on all small vessels in such a manner as not to be cumbersome and present too many difficulties. Every day we hear of drowning accidents caused by the capsizing of small vessels, and there is no reason why these safety frames cannot be used on the smaller vessels in our waters as well as on the Javanese vessels. In the vessels marked 6, 7, and 9 the safety frames are not provided, as these vessels are used for traffic on rivers.

No. 8 represents a Malay pirate vessel, in which a very ingenious device is provided for pressing the safety frames on the water, two rods being used at each end of the vessel instead of one, the rods crossing each other and struts being placed between the crossed ends of the rods, so that the upper end of one cross rod presses the outer end of the other upon the water.—*Illustrirte Zeitung.*



JAVANESE BOATS AT THE INTERNATIONAL COLONIAL EXHIBITION AT AMSTERDAM.

Toy Torpedoes.—How Made.

A reporter connected with the N. Y. *Sun* recently made a tour among the pyrotechnic manufacturers with the result of showing how the annoying torpedoes are made—those which children throw on the pavement with the result of startling staid men and women, and sometimes starting horses into unusual activity. The reporter that investigated found that silver was made into a fulminate by means of nitric acid, and charged into quills—goose quills—and this mixture of silver and mercury, with pebbles to give the proper amount of friction or percussion, comprehended all there was of the toy torpedo, which is entirely innocuous and only startling. The reporter says: "On the top floor of the house he visited a number of other children were seen working as rapidly as those on the floor below. In the middle of the floor was a huge pile of small pebbles or grit. A stalwart and motherly looking forewoman had the children in charge. A batch of five or six little ones sat on low stools on the floor under the skylight. Each held in her lap a board about two feet long by one foot wide. In this board, as in those seen below, were a number of indentures about a quarter of an inch wide and of the same depth. Each child was also supplied with pieces of tissue paper about an inch and a half square. These sheets of tissue paper rested in their laps, while the board was on their knees. They would put a piece of tissue paper over one of the indentures in the board, and then with a rounded stick would push down the middle of the paper into the hole. This made a bag of the little square of tissue paper. When every hole in the board had been filled with these bits of tissue paper punched into the form of bags, the board was handed over to the next little girl, who had a long quill filled with the fulminate. Into each of the little paper bags she dropped some of the fulminate, and then passed the board over to another little girl. This one sat near the pile of pebbles, from which she filled up every one of the tissue paper bags. Then she handed the board to a fourth little girl, who had at her side a little pot of paste. This one constantly touched her finger to the paste and then twisted the tops of the tissue paper bags together. When the little tissue paper bags were pulled out, they were perfect torpedoes of the regulation Fourth of July pattern.

GERMANY has 500 mills for the manufacture of wood pulp, and such a degree of perfection has been reached in its manufacture that even for the better qualities of paper it is a complete substitute for rags. Wood pulp constitutes 75 per cent of the paper stock used in that country.

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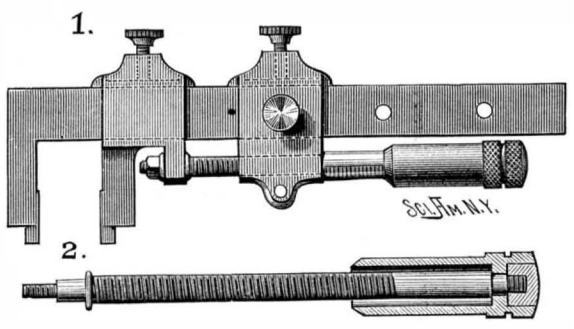
CALIPER GAUGE.

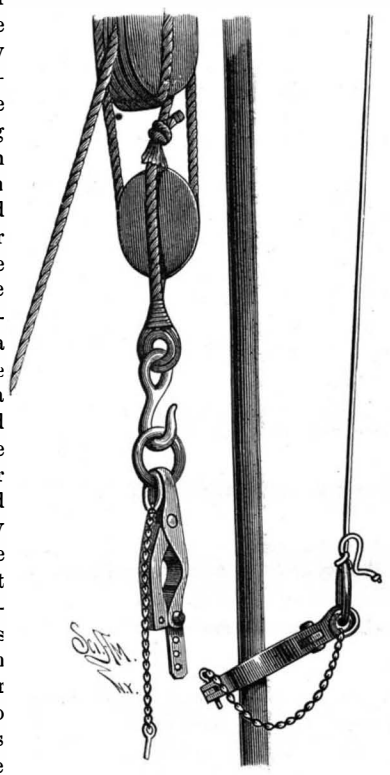
A caliper gauge arranged to be set by means of a screw and micrometer gauge graduations, whereby both internal and external measurements may be accurately made, has recently been patented by Mr. Eduard Sauter, of Hartford, Conn. One end of the beam is bent so as to form a right angle, and the inner end of the arm is reduced in size. A sliding jaw placed upon the long arm of the beam has an arm similar in shape to the first arm and placed parallel with it. A block or yoke also slides upon the long arm of the beam, but may be made fast to it by passing a pin through it and through either one of the holes in the beam, which are one inch apart. This permits the measurement of either long or short distances. To the rear edge of the yoke is secured a sleeve which is graduated and which forms the stationary graduation of the tool. The screw rod extends



through the sleeve, the yoke being tapped to receive the rod, whose front end is secured to the sliding jaw by a suitable nut and collar. On the other end of the screw rod is a revolving graduated sleeve, which, in connection with the sleeve on the yoke, constitutes the complete graduation of the tool. The sleeve on the screw rod surrounds the other sleeve and is clamped to the rear end of the screw by a nut (the construction will be readily understood from Fig. 2, which is a section through the screw rod), and is milled to facilitate turning for moving the jaw forward and backward. By the nut on the end of the rod, the rod may be adjusted while assembling the parts of the tool, or any wear occasioned by use may be taken up. The lower edge of the yoke is split and a screw inserted in order that the parts may be drawn together and clamp the screw rod, if this should be rendered necessary by wear. The jaw and sliding yoke are each provided with thumb screws by which they may be held fast to the beam. Fig. 1 is a side elevation of the gauge.

PIPE GRAPPLE.

The grapple under consideration is for use in raising and lowering pumps or well tubing, and for other work of similar character. The grapple is made with two jaws hinged together at one end, and provided with a link for their connection at the other end. The upper ends of the jaws are hinged together by a pin, one jaw extending beyond the hinge pin and being provided with an eye for connection with a hook and chain. The other ends of the jaws are slotted, and in one slot a link is permanently secured by a pin, and a movable pin carried by a chain is provided for connecting the link to the other jaw, so as to hold the two jaws firmly together, and at the same time permit of their disconnection. The two jaws are formed with concaves on their inner sides so as to allow the couplings on the pipes to be passed through without opening the jaws. In using the grapple two of them are necessary; one is attached to the pulley block for raising or lowering the pipe, and the other is suspended by a chain to some stationary beam, one or the other always being loose on the pipe. To use the grapple the pin is drawn from the one attached to the pulley, the grapple is opened, and the jaws passed around the pipe, when the pin is replaced.



As soon as a strain is put upon the hoisting rope, the grapple assumes an angular position with reference to the pipe and grasps it firmly, so that it may be raised or lowered. The other grapple is applied to the pipe directly under the one attached to the pulley block, and in the same manner. When the pipe has been raised or lowered to the desired position the ropes are slackened, so that the grapple may assume a right-angle position, allowing the coupling on the pipe to pass through freely. The stationary grapple holds the pipe while the other grapple is being shifted. The engraving represents one grapple attached to the pulley and the other in position on the pipe.

This invention has been patented by Mr. Elisha K. Green, of Los Angeles, Cal.

A Railroad in Palestine.

The first railroad in Palestine is being laid out, and the preliminary survey has been completed far as the Jordan. It is to run between Acre and Damascus, and it is called the Hamidié line, because it is named after his present Majesty, the Sultan Abdul Hamid, and probably one reason why the firman has been granted so easily lies in the fact that it passes through a great extent of property which he has recently acquired to the east of the plain of Esdraelon. The concession is held by ten or twelve gentlemen, some of whom are Moslems and some Christians, but all are Ottoman subjects resident in Syria. Among the most influential are the Messrs. Sursock, bankers, who own the greater part of the plain of Esdraelon, and who have, therefore, a large interest in the success of the line.

Starting from Acre, it will follow the curve of the bay for ten miles, in a southerly direction, at a distance of about two miles from the beach. Crossing the Kishon by a 60 foot bridge, it will turn east at the junction of a short branch line, two miles long, at Haifa. Hugging the foot of the Carmel Range, so as to avoid the Kishon marshes, it will pass through the gorge which separates that mountain from the lower ranges of the Galilee Hills, and debouch into the plain of Esdraelon. This plain it will traverse in its entire length. The station for Nazareth will be distant about twelve miles from that town; there may, however, be a short branch to the foot of the hills. So far there has only been a rise from the sea level in twenty miles of 210 feet, so that the grade is imperceptible. It now crosses the watershed and commences to descend across the plains of Jezreel to the valley of the Jordan. Here the Wady Jalud offers an easy incline as far as Beisan, the ancient Bethshan, and every mile of the country it has traversed so far is private property, and fairly cultivated.

At Beisan it enters upon a region which has, partly owing to malaria and partly to its insecurity, been abandoned to the Arabs, but it is the track of all others which the passage of a railway is likely to transfigure, for the abundance of the water, which is now allowed to stagnate in marshes, and which causes its unhealthiness, is destined to attract attention to its great fertility and natural advantages, which would, with proper drainage, render it the most profitable region in Palestine. Owing to the elevation of the springs, which send their copious streams across the site of Beisan, the rich plain which descends to the Jordan, 500 feet below, can be abundantly irrigated. There is a little bit of engineering required to carry the line down to the valley of the Jordan, here 800 feet below the level of the sea, which is then followed as far north as the Djisr el Medjâmieh.

Near this ancient Roman bridge of three arches, which is used to this day by the caravans of camels which bring the produce of the Hauran to the coast, the new railway bridge will cross the Jordan, probably the only one in the world which will have for its neighbor an actual bridge in use which was built by the Romans, thus, in this now semi-barbarous country, bringing into close contact an ancient and a modern civilization. After crossing the Jordan the line will follow the banks of that river to its junction with the Yarmuk, which it will also cross, and then traverse a fertile plain of rich alluvium, about five miles long and four wide, to the banks of the ridge which overlooks the eastern margin of the Sea of Tiberias. This is the extent to which the survey has been completed.

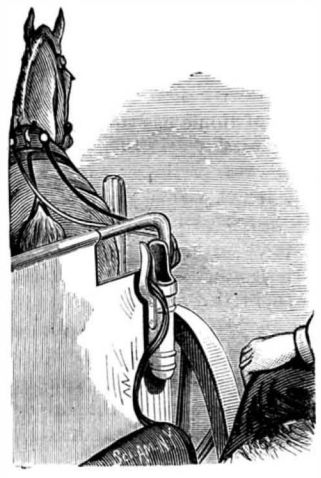
It is not decided whether to rise from the valley by the ridge which overlooks the Yarmuk, or to follow the east shore of the Lake of Tiberias to the Wady Semakh, which offers great advantages for a grade by which to ascend nearly 3,000 feet in about fifteen miles. This is the toughest bit of engineering on the line, and is in close proximity to the steep place down which the swine possessed by devils are said to have rushed into the sea. Once on the plateau, it will traverse the magnificent pasture lands of Jaulan and the grain growing country of Hauran, with probably a short branch to Mezrib, which is the principal grain emporium, and one of the most important halting places on the great pilgrimage road from Damascus to Mecca. It is calculated that the transport of grain alone from this region to the coast will suffice to pay a large dividend upon the capital required for the construction of the road, which will be about 130 miles in length. The grantees have also secured the right to put steam tugs upon the Lake of Tiberias, and under the influence of this new means of transportation the desolate shores will undergo transformation.—*Boston Advertiser.*

Burned by Melted Steel.

A very serious accident occurred during the meeting of the Iron and Steel Institute at Middlesborough, Eng., which painfully illustrates the danger incident to the visit of a large number of persons to industrial establishments. A number of members of the Institute visited the North-eastern Steel Works before the time appointed for their reception. When on the platform, on a level with the cupola top, one of the ladle buggies filled with molten metal stuck fast as it was pushed by a locomotive. The engineer backed up and tried to force the buggy over the obstruction by running against it. The shock broke the clutch, and the ladder began to swing around, slowly emptying its contents on the platform in the direction in which the visitors and a number of men were standing. All of them were covered with a spray of molten metal, a number were more or less injured, and one gentleman, Mr. Samuel Davison, of the Horbury Bridge Iron Works, near Wakefield, was so seriously burnt that he expired a few hours afterward.

COMBINED WHIP AND REIN HOLDER.

The whip socket may be made of wood, metal, leather, or any other suitable material, and can be secured to the dashboard or other part of the vehicle convenient to the driver. Its upper end is provided with a guide at the back for guiding the butt end of the whip down into the socket, which is a great convenience in putting away the whip while the carriage is in motion.



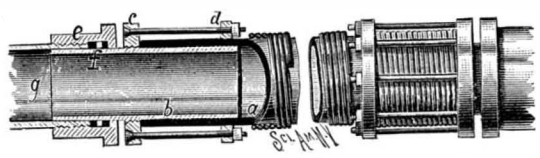
The device for holding the rein is a properly shaped flat spring, as shown in the engraving, secured to the side of the socket, with its upper end pressing against the outer surface of the socket or guide, so that the reins may be easily slipped between the spring and the socket, where they will be held by the pressure of the spring. The accompanying illustration shows the reins held by the spring. This invention has been patented by Messrs. Nathaniel Robertson and H. C. Doll, of Denver, Col.

Firemen Bothered by Iron Shutters.

At a fire in Lispenard Street, this city, on the 8th inst., the firemen lost considerable time in getting in the building, as the door and windows were guarded by iron shutters. As generally constructed, these shutters are rolled up by means of a crank or key upon the inside and cannot be raised or lowered from the outside. Upon this subject Chief Engineer Bates, of the Fire Department, said to a reporter: "Once inside the door the work is easy, though we have to fight for every inch of distance we raise them from the outside. They might just as well be made to work with the iron key of our hose carts, but they never are. The unnecessary delays to which firemen are subjected by such arrangements as these increase the aggregate loss from fires in this city from thirty to fifty per cent."

PIPE AND HOSE COUPLING.

The accompanying illustration of this coupling is a longitudinal elevation, parts being broken out and others shown in section. In each end of the rubber tube, *a*, is inserted a piece of metallic tubing, *b*, so that one-half of the latter projects from the end. At the end of the rubber tube, the metallic tube is threaded for the reception of a collar, *c*, against which the end of the rubber tube abuts. Wires are coiled firmly around the rubber tube to press it against the inner tube. A ring, *d*, rests against the other end of the coiled wire, and screw bolts having countersunk ends in the ring, *e*, pass through the ring, *d*, when by drawing the nuts up tightly the coiled wire will be pressed between the rings and against the rubber. Between the ends, the rubber tube



is wound with wire to strengthen it. The end of the metallic tube projecting from the rubber tube is provided with an annular ridge, *f*, between which and the adjoining ring, *c*, is the inwardly projecting end flange of a sleeve, *e*, which has its inner surface threaded to admit the end of the pipe, *g*. Packing rings are placed against both side surfaces of the annular ridge to insure a close joint. The pipe to be coupled is screwed into the collar, *e*, the end of the tube, *b*, passing into the end of the pipe, which rests against one of the packing rings.

This invention has been patented by Mr. J. Adolphe Perrottet, 413 Sixth Ave., New York city.

Resignation of Commissioner Marble.

The Secretary of the Interior has accepted the resignation of Edgar A. Marble, Commissioner of Patents, to take effect on October 31. Mr. Marble had tendered his resignation on three occasions during the present year, but it was withdrawn at the request of Secretary Teller. Several candidates for the commissionership have been considered, and the last rumor says the position has been offered to a Western ex Congressman, but the report needs confirming.

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Fast Steam Navigation.

It is evident that next summer we shall see a very marked increase in the speed of ocean steamers. Already the Alaska and the City of Rome have crossed the ocean repeatedly in less than seven days. There are several other vessels the speed of which falls but little behind that of the two fliers just named, and it is quite possible, in view of the speed attained by the Aurania previous to the accident to her machinery, that she is as fast as, if not faster than, the Alaska and the Rome. The ocean passage having thus been cut down to a few hours less than seven days, the achievement of next summer will be the further shortening of the time to less than six days.

Of two steamers which will take their places on the Guion and the National Line, respectively, next spring, there is every reason to believe that they will greatly surpass the achievements of the fastest steamers now afloat. The new Guion steamer, the Oregon, has made two trial trips, and on each occasion has logged twenty knots an hour. This is equivalent to a speed of a little more than twenty-three miles an hour, or nearly three miles an hour more than the Alaska or the City of Rome has steamed. If the Oregon can maintain the same rate of speed when crossing the Atlantic she will make an average run of 550 miles a day, and will at that rate easily cross the Atlantic in less than six days. Of course, it is probable that her trial trips were made in the most favorable circumstances, and that a heavy head sea would reduce her speed. On the other hand, it must be remembered that her machinery is entirely new, and that after it has been in use for a few weeks her speed may reasonably be expected to increase.

The new National steamer, the America, is building in the same yard in which the Alaska, the Arizona, and the Oregon were built, and her builder guarantees that she shall have a speed of eighteen knots an hour. At this rate she can steam nearly 500 miles a day, and in all probability her speed will be above that which is guaranteed. At any rate, the America will be able to cross the Atlantic inside of six days, and will certainly be surpassed in speed by no steamer, unless it may be the Oregon.

Hitherto the National Steamship Company, which can boast of never having lost a passenger during the sixteen years of its existence—a boast which no other company can make except the Cunard Company—has not aimed at building fast steamers. Its managers have evidently now perceived that the time is close at hand when the freight and the passenger business must be separated. Of course, the slower steamers will continue to carry more or less passengers and the fast steamers will carry a small amount of freight; but in the near future it will be found profitable to build steamers mainly designed to carry passengers. The model of the America was recently exhibited at Liverpool, where it was awarded a gold medal for its excellence as a passenger vessel, and from the published descriptions it seems as if both the America and the Oregon will furnish accommodations as much superior to those of ordinary steamers as the accommodations of Pullman cars are to those of the ordinary model. Such vessels will always be crowded with passengers, at rates which will prove immensely profitable. Their success will stimulate efforts to build faster and, if possible, finer vessels, and there is no reason to doubt that within a very few years Mr. Pierce will accomplish his avowed purpose of building a steamer that will cross the Atlantic in five days.

Of Mr. Corbin's new steamers, which are to run between Montauk Point and Milford Haven, little is known except that the company is organized and that the vessels will be placed on the route next summer. It may be safely prophesied that as Mr. Corbin's original object was to shorten the Atlantic passage twenty four hours, he will not lose the advantage which his shorter route will give him, no matter how fast the Guion and National steamers may prove. If the latter make the passage within six days Mr. Corbin's steamers will have to make it within five days, a feat which can be performed even if his steamers should possess no greater speed than that of their Liverpool rivals.—*N. Y. Times.*

Steam Boiler Inspection.

Professor Thurston, in a communication to *Science* on the Riverdale boiler explosion, the particulars of which have been already published in these columns, censures the inspector, who had tested the boiler only two months previous to the explosion, for not having discovered its dangerous condition; and he adds, what every engineer knows to be a fact, that a steam boiler of the most ordinary and least dangerous type has stored within it an inconceivable amount of available energy in the form of heat, which may be at any moment transformed, in part, into mechanical energy with terribly destructive results, both to life and property; that this powerful agent for good or for evil can only be safely utilized when the utmost care, intelligence, and skill are employed in its application, and in the preservation of the vessel in which it is inclosed; that the present code of law relating to the care, management, and inspection of steam boilers, is entirely inadequate to insure safety; that the inspection of steam boilers, as at present practiced by the employes of the government, is not only liable to be inefficient, but is likely to prove worse than none, as it gives to the owner, and perhaps often to the man in charge, of the boiler, a feeling of security which is entirely without basis in fact, and which may therefore cause the neglect of that watchfulness which might otherwise prevent accident; that simple pressure produced by the test pump, as now provided for by the law, is not a sufficiently effective method of detecting weakness in the boiler, or to be relied upon to the exclusion of other better and well known methods of test.

The fact that the hydrostatic test is not conclusive as to the safety of a boiler has long been well known and admitted among intelligent engineers. The steam ferryboat Westfield met with precisely such an accident a dozen years ago; and it was shown at the coroner's inquest, at which the writer assisted that official in the examination of his expert witnesses, that the boiler had been inspected, and had been tested but a few weeks before, by the United States inspector, who applied a pressure considerably in excess of that at which the explosion took place. The cause of the accident, by which a large number of people lost their lives, was precisely that which caused the explosion of the Riverdale's boiler, and the method of rupture was the same. In either case, proper methods of inspection would have saved the lives of the sufferers.

It is undoubtedly true, as Professor Thurston states, that many of the inspectors are conscientious, experienced, skillful, and painstaking men, and do their duty in spite of the defects of the existing law; but it is also true that now and then a careless or incompetent inspector will neglect the simplest details of his work, and that we must expect occasional repetition of this sad experience, until the law is intelligently framed, and so administered that the passing of a defective boiler by the inspector shall become as nearly as possible an impossibility.

EVAPORATOR FOR REGISTERS.

We are all familiar with the disagreeable effects produced by the hot air coming from some furnaces and fireplace stoves. To overcome these difficulties the evaporator herewith illustrated was designed. It consists of a reservoir of water of suitable shape and size to be placed before the register as shown. A removable shield is so arranged that it

MEYER'S EVAPORATOR FOR REGISTERS.

deflects the heated air, which passes over the water, which it absorbs in its passage. It will be efficient in increasing the humidity of the air if placed over a floor register. The form permits of ornamentation, either elaborate or plain, according to the taste of the user. The evaporator was patented by Mr. John F. Meyer, of 28 N. Howard Street, Baltimore, Md., and Messrs. Southcomb & Bro., same address, are the sole agents.

Utilizing the Alligators.

A reporter for the New Orleans *Picayune* has been investigating the alligator, its uses, commercial value, etc. The following are some of his observations:

The edicts of fashion have sent hunters into the tropical forests of Borneo and Java to bring back the plumage of birds of paradise to decorate female head gear. To-day these same imperial edicts send the hunter to the swamps and jungles of Louisiana to procure the hide of the alligator for slippers to clothe the dainty feet of fair women and to make satchels and bags in which to carry their handkerchiefs and pocket money.

The most fashionable material for small valises, satchels, hand bags, portmonnaies, and the like, is the skin of the American alligator, and in all the Gulf States, from Florida to Texas, these saurians are hunted to supply the demand. This fashion has not been in vogue for a very long time, but for the past three years the slaughter of the alligator has been carried on with great activity.

A reporter desiring to make some inquiry as to the extent of the trade in the skins of these saurians, visited several dealers in hides and furs on Peters Street. A number of the dealers handle alligator hides quite largely, and they were found entirely willing to give information on the subject. At the warehouse of Messrs. B. F. Simms & Son, a lot of several thousand of these skins were seen in process of being packed for shipment to New York and Boston. The skins were in the state known to the trade as "green salted," the freshly gathered hides being pickled in salt and remaining soft and pliable. There were the skins of saurians, from those of youngsters not much more than a yard long to the hides of monsters that must have measured twelve to fifteen feet when alive. One skin, minus the tail and the snout, measured thirteen feet by the line, with a corresponding breadth. The integument freed from the bony scales, which, like massive plate and armor, cover the back and head of the animal, was as heavy and as thick as a bull's hide, of which stout sole leather is made.

Only the skin of the belly and sides is used, the back with its coat of mail being cut from the hide and thrown away as worthless. Of a blackish blue hue on the sides and bluish white under the belly, all the skins showed great uniformity of color, and each was curiously checkered in squares, which being separated by intersecting grooves and wrinkled, gave the peculiar checkered appearance seen in all alligator leather. The flat parts of the skin are used for bags and satchels, while those portions covering the knees and elbows of the monsters' legs are peculiarly suited for the fronts of shoes and boots.

The trade in these skins takes them of all sizes from four feet up, the average prices paid here for green skins ranging from ten cents each for the smallest to ninety cents for the largest. The skins most in demand are about seven feet long, which is perhaps an average of full grown alligators. Those from ten to fifteen feet long are classed as monsters.

Inquiry as to the number of these hides handled in this market during the present season elicited some variance of estimates among different dealers, but the figures may be put with a degree of accuracy at something like 50,000 skins. Three years ago 100,000 skins were handled here, and the next year the figures were reduced to 70,000. The further reduction to 50,000 for the present season caused inquiry, when it was learned that there is no lack of demand for the hides, but the alligators are actually growing scarcer as well as more difficult to find.

Besides the hides, there are other products of the alligator utilized for commercial purposes. The teeth, which are round, white, and conical, and as long as two joints of an average finger, are mounted with gold or silver, and used for jewelry trinkets and for teething babies to play with. All the teeth of the alligator are of this class of conical tusks, with no cutting or grinding apparatus, and hence the animal is forced to feed chiefly on carrion, which is ready prepared for his digestion.

The oil extracted from this creature has a high reputation among the swampers as a remedy for rheumatism, being given both inwardly and externally, and is produced to supply a limited demand.

The Lead Pencil.

There is no lead pencil; and there has been none for fifty years. There was a time when a spiracle of lead, cut from the bar or sheet, sufficed to make marks on white paper or some rougher abrading material. The name of lead pencil came from the old notion that the products of the Cumberland mines, England, were lead, instead of being plumbago, or graphite, a carbonate of iron, capable of leaving a lead-colored mark. With the original lead pencil or slip, and with the earlier styles of the "lead" pencil made direct from the Cumberland mine, the wetting of the pencil was a preliminary of writing. But since it has become a manufacture the lead pencil is adapted, by numbers or letters, to each particular design. There are grades of hardness, from the pencil that may be sharpened to a needle point, to one that makes a broad mark. Between the two extremes there are a number of graduations that cover all the conveniences of the lead pencil. These graduations are made by taking the original carbonate, and grinding it, and mixing it with a fine quality of clay in differing proportions, regard being had to the use of the pencil. The mixture is thorough, the mass is squeezed through dies to form and size it, is dried, and incased in its wood envelope.

Borax for Extracting Coloring Matters.

For isolating alizarin and purpurin from garancine, R. Palm digests in a solution of borax saturated in the cold until a deep blood-red solution is formed. The liquid is filtered and completely precipitated with sulphuric, hydrochloric, or acetic acid. The bulky violet-brown precipitate is boiled for a long time with a saturated solution of alum. From the filtered decoction alizarin is deposited on cooling and filtered off. The filtrate deposits alizarin on the addition of concentrated sulphuric acid. The author also applies borax for the extraction of santaline from sanders wood, and a violet coloring matter, not identical with carmine, from cochineal.—*Zeitschrift fur Anal. Chemie.*

Acknowledgment of Credit.

In the SCIENTIFIC AMERICAN for August 11, 1883, we gave illustrations of the Central Telephone Exchange of Paris, and by an inadvertence of our assistant, due credit therefor was omitted. We now take pleasure in saying that we were indebted for the engravings and particulars to our esteemed contemporary, *La Lumiere Electrique.*

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ENGINEERING INVENTIONS.

A car coupling designed for freight cars has been recently patented by Messrs. Thomas R. Morgan, Guy Ruf, and David Davis, of Jackson, O., in the use of which the drawhead has a slot in its lower side, to allow the link (in this case a hook) to drop out of position when cars are to be run together without coupling. The hook is pivoted and is attached to a bell crank lever by which it may be raised by a rod at the top of the car or by one at the side of the car.

Mr. Nathan M. George, of Danbury, Conn., has patented a device for preventing dust from entering the axle boxes of railroad car and engine axle bearings, and inducing heating and producing wear. The contrivance is composed of a gland of wood, and two of leather embracing a packing of felt. Vulcanized fiber or similar material may be used instead of leather; a spring is used to hold the protector in place. This device may be applied to any car and locomotive axle now in use.

Messrs. Henry W. Robie, of Portsmouth, Va., and William H. Lyons, of Berkeley, Va., have invented an apparatus for utilizing the exhaust steam of a steam pump by discharging the steam into the suction side of the pump, to utilize the atmospheric pressure gained by condensing the exhaust steam, and to condense the steam for returning the heat of it, or most of the heat, to the boiler, the said arrangement consisting of a branched exhaust pipe connecting with both ends of a double acting pump, and each branch having a check valve to prevent reaction on the steam engine when the compression of the pump takes place.

An automatic switch and crossing signal for railroads has been patented by Mr. Daniel H. Applegate, of Red Bank, N. J. It is intended to be worked by an electric battery, and also to use at night an electric light to be lighted and extinguished by a passing train. The covering of the light is made by two semicircular plates hinged so as to fall by their own weight and arranged to be raised when electrical contact is made by the wheels of the train. The outside surface of these disks are covered with illuminating paint to make them conspicuous, and to prevent the necessity of an artificial light when the signal itself is not exposed.

MECHANICAL INVENTIONS.

An improved welding, swaging, and forming die for making chain links is the invention of Mr. Henry A. Iddings, of Warren, O. The invention is to form a longer lap weld than usual, and to thicken those portions of the link—the ends—which are exposed to the greatest amount of wear. These results are accomplished by means of divided dies, the parts being made movable.

Mr. Leonidas A. Roberts, of Monticello, Ga., has patented an improved method of securing the ends or joints of rubber belts by re-enforcing the ends at the point of jointure by a flap of leather cut so as to cover the face of the belt, and pass under it on each side. The entire joint is made either by lacing or rivets, or metallic hooks passed through, bent, and clinched. The method demands no skilled labor or engineering calculations.

Messrs. Stephen J. Swayze and John C. Lane, of Sag Harbor, N. Y., have invented an automatic railroad signal intended to provide a signal adapted to be automatically set by the tread or flange of the wheel of the locomotive or car, or any device attached to the engine or car, and to automatically and gradually recede into its inclosure in a given length of time; and this length of time may be governed so that the device may be used as a crossing signal for following trains.

Mr. William P. Badger, of Muscotah, Kas., has patented an improved wind wheel that by means of the reciprocating action of springs and the centrifugal velocity of the wheel, opens and closes automatically the fans or wings of the wheel, to produce a uniform velocity under all circumstances of the force of the wind. A wind chamber is also provided to increase the number of square feet of wind pressure on the wheel.

A machine for forming earthenware vessels has been invented by Mr. Cerbeleon Martinez Ribon, of Mompos, Bolivar, United States of Colombia, by which the clay is placed in a sectional mould which is secured to the plate of a potter's wheel, or a "jigger," and while being revolved a knife, the edge of which conforms to a vertical section of the interior of the vessel to be made, is inserted by foot or hand power, and the clay is rapidly made to the desired internal shape.

Mr. John D. Waldran, of Memphis, Tenn., has invented a handy valve grinder which consists of a contrivance for attachment to the wheel of a globe valve for rotating it backward and forward on its seat by means of a spiral shaft that is operated by means of a reciprocating nut, which is operated by one hand, while the guide for the nut and support is held by the other hand, making a simple contrivance by which such valves may be ground quickly and efficiently without being disconnected from the pipes.

Mr. Jackson Taylor, of Newberry, S. C., has patented an improved side spring for carriages by which the springs are resistant to side shocks and lateral movements. The springs are also re-enforced by bent U-shaped inner springs that make the central portion of the spring very rigid and yet give elasticity to their ends. The ends of the springs are connected to the carriage by eccentrically pivoted shackle pins, by which the action of the springs under a load is rendered uniform.

Mr. John Henry Nute, of New Glasgow, Nova Scotia, Canada, has invented a machine for serving rope which can be operated by hand to serve rope or other materials with yarn or twine, the operation being automatic, and the feed regulated to suit the size of the yarn used, so that by steadying the machine with one hand and turning the driving wheel with the other the spool frame is rotated around the rope to be served, the serving yarn unwinding from the spool and winding around the rope automatically and with accuracy and speed.

Mr. Brock Woodruff, of Albert Lea, Minn., has invented an improved process of treating iron in which ordinary wrought iron is first heated to near a welding heat, then rolled in sand, reheated to a somewhat higher temperature than before, again rolled in sand, and again reheated to a welding heat, when it is immediately immersed in water to which has been added common salt in the proportion of one gallon of salt to twelve or fifteen of water, more or less. Iron made by this process may be heated, worked, welded, and otherwise manipulated without destruction of the properties imparted to it in the process named. The iron is very hard and tough, and is far superior to ordinary rolled iron for any ordinary purpose.

Mr. Oswald Fachmon, of Lindsey, Ohio, has patented an improved drag saw, the invention consisting of a cam contrivance for working the saw, a lever device for raising and lowering the saw, a power apparatus for rolling the logs to the ways to be sawed, a lever contrivance to feed the logs to the saw, and a guide attachment for the saw, all contrived for the application of power to the driving of the saw, so as to have steadier motion of the saw, and so as to avoid the back thrust that the drag of the saw causes, which is very injurious, especially when horses are used; and the log rolling and feeding and saw adjusting devices are contrived with especial arrangement for convenience in manipulating them by the attendant.

AGRICULTURAL INVENTIONS.

A cotton harvesting machine has been patented by Messrs. John Myers and John Edward Myers, of Palestine, Texas, the gathering being done by a series of long and short toothed belts arranged side by side alternately, and adapted to pass over and through the stands of cotton. By fixed appliances in front of the machine any bent or broken branches of the cotton plant are raised to connection with the toothed belts. Their load is relieved and deposited in the wagon by a toothed wheel as fast as it is gathered.

Mr. Knight K. Parker, of Circleville, O., has invented a straw stacker for removing the straw from a thrasher and stacking it into a longitudinal rick, making the rick of uniform sides and even height. The stacker is an appendage to the thrashing machine, and is run by the same power; when not in use it may be folded back on the top of the thrashing machine and be carried from place to place. One-half interest in the invention belongs to Mr. George Ludwig, also of Circleville.

Mr. Walter F. Drew, of Sacramento, Cal., has invented a rake head for rakes with wire teeth, by which a broken tooth may be readily removed and easily replaced by a new tooth. In this invention a single tooth is bent at right angles at its upper end, the bent portion resting in a groove; or, a double tooth is used that has its horizontal upper portion likewise embedded. When put in, the teeth are straight, but once in, they are bent to a curve, the offset thus made helping to keep them seated in place.

Mr. Charles T. Mason, Jr., of Sumter, S. C., has invented a cotton harvester which is intended to reduce the expense of the present method of picking cotton by hand. The picking is done by serrated disks of brass or other non-corrodible metal, protected by shields of wood from unnecessary wear and abrasion. The disks are suspended on vertical stems and are rotated by bevel gears on a frame carried by chains and pulleys, so that the pickers rise and lower without disturbing the plants or breaking off the hard wooded portions.

MISCELLANEOUS INVENTIONS.

A handy folding table has been patented by Mr. Frederick Gesking, of Grand Rapids, Mich., that can be taken down and put up with little trouble and in little time. When folded it occupies scarcely any more space than the board top alone, and when erected for use it is not only firm, but may be made elegant.

An improved form of truss pad has recently been patented by Mr. Elias Thompson, of Commercial Point, O., the construction or rather the form of which is intended to give better protection to a rupture in the lower part of the abdomen than the pads now in use. For this form of pad the inventor claims that no annoyance is felt by different posturings and that the sac cannot possibly escape from its confinement.

Mr. William Klahr, of Myerstown, Pa., has patented an improved bicycle to be driven by pedals operating pawls on ratchet wheels in place of crank and lever. The small wheel is in front on this bicycle, and the rider sits in front of the top of the large wheel, a position that gives him unusual power over the driving mechanism, the pedals being considerably in advance of the hubs of the large wheel.

A clamp for dumb waiters and similar contrivances has been patented by Mr. Edward Lange, of Poughkeepsie, N. Y., which is intended to save the elevating rope from wear and to be self-releasing as soon as the pressure of the hand is removed. The jaws or clamps that embrace the rope are lined with rubber or leather or some other gradually resisting material, and cannot wear the rope or make any noise in operation.

A handy book rest for supporting the hand while writing, when a convenient table or desk is not at hand, has been patented by Mr. Charles H. Metz, of Utica, N. Y. It may be attached to any book, whatever its size, and may be instantly detached. The rest, proper, is a thin sheet of metal, a thin wood board, or a pasteboard hinged to a U-shaped clasp of wire that may embrace any portion of a book without injury to the book.

Mr. John Owen Kilroy, of Albany, N. Y., has invented an improved tobacco pipe which is so constructed that the nicotine cannot pass into the mouth and the smoke cannot burn or bite the mouth and tongue of the smoker, and thus renders smoking very agreeable. The several parts can easily be detached and removed for the purpose of cleaning them, so that the smoke will always taste fresh and sweet. The bowl can be made of any desired shape.

A combination railroad ticket, useful for routes by different roads, and containing in itself the particulars usually sought in railway guides, has been recently patented by Mr. James W. Womeldorf, of Middleport, O. The ticket may be used for more than one person simultaneously, and may be used, also for different roads and different stations, the conductors each having their distinctive stubs, and furnishing the basis for a final settlement between the different roads.

Messrs. Lorenzo D. C. Wood, of Newark, N. J., and Thomas B. Dorrell, of Brooklyn, N. Y., have patented a new package fire kindler, which comprises in one package a paper bag, box, or wrapper, which forms a component part of the kindler, kindling wood in detached pieces, and a highly combustible lighter. The paper wrapper and its contents constitute a cheap, convenient, and efficient fire kindler in compact package form, and makes a new article of manufacture, trade, or commerce, each package consisting of sufficient material to light a single fire.

Mr. John Walter, of Nashville, Tenn., has invented a convenient clasp, or coupling, for stove and heat pipes made of thin metal, that obviates the necessity of forming the ends, or joints so that they slip one within the other, or of permamently riveting sections together. The ends of the sections are beaded or corrugated and an open corrugated band fits around them, the ends being locked by a key of sheet metal, the edges of which are recurved to embrace the end corrugations on the band. By this device sections of pipe may readily be united and taken apart.

Mr. John C. Jessup, of New York city, has invented an improvement in color cans, the object of which is to facilitate the discharge of prepared color or paint from cans. The invention consists in a color can constructed with a central discharge opening and provided with a swiveled right and left screw and two pressure disks moving from the ends of the can toward its center, so that all the color can be discharged from the can, the disks gradually approaching each other, as the right and left hand screw is turned and a meeting at the center of the can, where the discharge opening is.

Mr. Moses Humber, of Calliope, Iowa, has invented a combined horse collar and hames with a view to prevent galling, chafing, pressure on the wind pipe of the horse, and to put the load of the draught on that portion of the animal most able to bear it. The collar proper is of wood worked to fit the horse's neck, and cushioned inside. On the outside it is covered by a steel plate connected at top and bottom by adjustable plates. The loops for the tugs are turned at right angles to the collar, by which a portion of the load is borne by the flat of the neck, permitting the shoulders of the animal to move freely.

Mr. George N. Buck, of Mattoon, Ill., has invented a tag fastener which consists of a single piece of wire or other suitable material, which is doubled upon itself like a staple and inserted through the tag, and then has its extreme ends, which are pointed, bent up in the same direction with each other, and in a direction at right angles with the plane of its body or prongs, to form catches for holding the fastener in place. The prongs, which incline outwardly at the ends, are thus adapted to be inserted between the folds of cloth in the roll until the back of the tag is in contact with the end of the roll; and as the ends are inclined toward the tag, any outward movement of the fastener will cause the said ends to sink into the adjacent fold or folds of the cloth and prevent its accidental withdrawal.

NEW BOOKS AND PUBLICATIONS.

GAMES OF PATIENCE, OR SOLITAIRE WITH CARDS. By W. B. Dick. Illustrated. Dick & Fitzgerald, New York.

The book contains rules for playing forty-four games, and thirty-three full page illustrations.

DESIGN IN TEXTILE FABRICS. By Thomas R. Ashenhurst, Head Master, Textile Department, Bradford Technical College, England. Published by Cassell & Co., London, Paris, and New York.

This admirable work contains, in a convenient form, a mass of useful facts about weaving, illustrated by several colored plates, and over one hundred diagrams. The author says: "The practice of paying little or no attention to the proper structure of the fabric, and its suitability for the purposes to which it is to be applied, is the cause of considerable waste in manufacture." The object of this manual is to suggest patterns and show means of producing new ones by modification, in the loom mechanism, and preparation of the warp or woof. The book will be of value to all who are interested in the progress and perfection of textile industries.

WORKSHOP RECEIPTS (SECOND SERIES). By Robert Haldane. E. & F. N. Spon, London; 35 Murray Street, New York. Price $2.00.

The success of the original "Workshop Receipts" induced the author to produce this second series after the same pattern. There are many subjects in all branches of applied science which are not treated of in the great industrial encyclopœdias, and yet are of considerable interest to scientific amateurs and manufacturers on a moderate scale. In the present work each subject is treated exhaustively and in such a manner that the information sought can be readily obtained. For instance, the topic of boiler incrustations is opened by numerous analyses of feed water from rivers, lakes, wells, town supply, rain, canals, pits, springs, and the sea, with analyses of the incrustations produced by them, and a critical examination of the various chemical, chemico-mechanical, and physical processes for preventing boiler corrosion. In this way are treated, among many others, albumen, bleaching, cements and lutes, cleansing, confectionery, copying, dyeing, staining and coloring, essences, extracts, gelatine, glue and size, glycerine, leather, paper, pigments, paint, and painting. The subdivisions of each head are arranged alphabetically. The language of the book is simple, accurate, and concise.

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Bradley's Road Card, Syracuse, N. Y. See p. 236.

Wilde's Car Brake, which is illustrated on page 243, this issue, is offered for sale. For full particulars address W. A. Wilde, 126 State St., Chicago, Ill.

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Curtis' Expansion Trap. See illustration on p. 118.

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Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 254.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 204

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Drop Forgings. Billings & Spencer Co. See adv., p. 189

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C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 221

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Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 238.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

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Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Emerson's Hand Book of Saws. New Edition. Free. Address Emerson, Smith & Co., Beaver Falls, Pa.

Gould & Eberhardt. Machinists' Tools. See adv., p. 236.

Barrel, Keg, Hogshead, Stave Mach'y. See ad., p. 236.

The Lehigh Valley Emery Wheel Co., Lehighton, Pa., sell a new Stove Plate Grinder, with traverse motion, and an Automatic Planer Knife Grinder, with a cup wheel. Cuts and descriptions sent upon application.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 237.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

Hoisting Engines. Friction Clutch Pulleys, Cut-off Couplings. D. Frisbie & Co., Philadelphia, Pa.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) H. H. writes: I see in your reference book that 403° of heat give 240 pounds pressure. Will be pleased to know the degrees of heat with the pressure (steam) at 300, 400, 500, and 600 pounds. A. At 300 pounds total pressure or 285 pounds by gauge, temperature 417·5°; at 400 pounds total pressure, 445° Fah.; at 500 pounds total pressure, 467·5° Fah.; at 600 pounds total pressure, 487° Fah.

(2) H. B. S. writes: Will you please let me know about what power will be required to force a steel shaft 2 inches diameter into block of cast iron 4 inches square, bored the proper size to make a very tight fit. These blocks of iron are 24 inches long, and the shaft goes through, having a bearing at each end of about 6 inches; if the shaft is turned 2 inches diameter, what should the bore be? Or, in other words, what should the difference be between the shaft and the bore? A. We know of no experiments or tests approximating the case you present; it can only be determined by experiment. The following case of actual practice may be a guide: Iron shaft or pin 3 inches diameter and 4 inches length of bearing; allowance for difference of inside and outside diameters one-sixty-fourth inch; pressure required to force together, 600 to 800 pounds per square inch; the former if the hole be rough bored, and the latter when the surfaces are very true and smooth. Another case from actual practice is upon a 7 inch diameter shaft, an allowance of one one-hundredth inch between inside and outside diameters.

(3) A. S. writes: Please give me a receipt for type metal and black printer's ink. A. Lead 3 pounds, antimony 1 pound; or lead 9 pounds, antimony 2 pounds, bismuth 1 pound. 2. Boil 1½ gallons linseed oil to a thick varnish; while hot stir into it 6 pounds powdered rosin, 1¾ pounds dry brown soap in shavings, then 2½ ounces indigo, 2½ ounces Paris blue, and 5 pounds best lamp black. Let it stand a week. There is considerable danger of fire in boiling the linseed oil. Every ink factory has its own secrets.

(4) E. S. M. asks: What sized engine would be required to run a boat 15 feet long and 4 feet wide, and how many miles per hour would it run? A. For a propeller yacht, engine 3 inches cylinder by 3½ inches or 4 inches stroke. Boiler with about 40 feet fire surface. Propeller about 18 inches diameter; probably get a speed of about 6 miles per hour.

(5) J.M. E. asks: 1. How can I ebonize pine or poplar for cheap furniture? A. Dissolve copperas in cold water by shaking; paint the wood with it two or three times. After it has dried apply two or three coats of a strong decoction of logwood. When this too has dried wash off the wood, and when dry oil and polish it. 2. Give directions for making walnut stain. A. (*a*) 1 quart water, 1½ ounces washing soda, 2½ ounces Vandyke brown, one-quarter ounce oichromate of potash. Boil for ten minutes and apply with a brush either hot or cold. (*b*) Permanganate of potash dissolved in water gives a good brown stain.

(6) D. S. writes: Will you please advise me whether "storm glasses" (camphor and nitrate of potash) should be hermetically closed or not? Some authorities close hermetically with plaster of Paris, others with cork, perforated. A. They should have a very fine aperture in their tops for admission of air. Plaster of Paris alone will not close hermetically, as it is porous.

(7) P. D. writes: Will you please tell me what flavor is used in flavoring the ordinary bottled soda water or "pop," the proportions, and the process? A. Various flavors are used, principally lemon and sarsaparilla. For the first a lemon sirup is made as follows: Simple sirup, 1 gallon; extract of lemon, half an ounce; fruit acid, 1 ounce. For sarsaparilla sirup the following is the formula: Oil of anise, 15 drops; oil of wintergreen, 15 drops; oil of sassafras, 15 drops; fluid extract sarsaparilla, 2 ounces; simple sirup, 5 pints; powdered extract licorice, half an ounce. A sufficiency of the sirup is mixed with the water and the whole is then charged with gas.

(8) J. A. K. writes: I have a telephone line, 250 rods. Instruments are intended to work without battery; wire No. 18 annealed iron, tight as could draw with hands, put up as directed. Don't work. Can you please tell me through your valuable paper if the distance is too great, or what is wrong? A. If you are using a magneto telephone similar to Bell's, we are unable to say—without further particulars—where the trouble is; but if your instrument is an acoustic or mechanical telephone, your wire is too large and its tension is too great. Use a fine twisted wire cable cord and suspend it with strings, so that it will be free to vibrate endwise.

(9) S. T. N. writes: Would you please state in your paper what will prevent white cast iron from blowing when poured around wrought iron? A. To prevent cast iron from blowing when poured around wrought iron: Clean the wrought iron free from scale with muriatic acid, wash free from acid and heat to 300°, put in the mould hot and pour at once.

(10) V. E. St. C. writes: Will you please answer the following in the SCIENTIFIC AMERICAN? When there is 100 pounds steam pressure in a boiler, is not the pressure equal at top and bottom of the boiler shell? A. The pressure is not quite even at the top and bottom of a boiler at any pressure; the difference is due to the weight of the water, which amounts to one pound in 27 inches from the water line down.

(11) S. C. writes: 1. Please inform me if possible about what height the common 1 pound and 2 pound rockets attain. A. Rockets are very variable in the height of their flight; a 1 pound rocket will carry to a height of from 300 to 500 feet, a 2 pound rocket from 400 to 800; much depends upon the clean finish and shape of head and stick. 2. What plan would you suggest for increasing the warmth of a country house, built of wood? I have been advised to take off the ontside boards, and cover the house with tar paper, and then replace the boards. Would there be a strong odor of tar through the house in summer? A. For making your house impervious to winds, cold, heat, and moisture, take off the clapboards, fill in between the studding with brick, flat or edge as convenient, tight laid with mortar, then cover the studding with felt paper well lapped, and clapboard. If the paper is lightly tarred, it will give off a little odor the first year and will be waterproof, but not warmer than the felt paper. The tar odor is healthy.

(12) E. L. P. asks how to make a solution of oxide of copper for depositing iridescent colors on metals; also what kind of a current it is best to use. Is it practical to solder aluminum? If so, what is the best solder to use and what kind of flux is best? A. 1. Sulphide of arsenic is said to be used for the purpose, probably in solution in sulphide of ammonium. It may be applied by heat. 2. Many alloys are given for aluminum solder. They range as follows: Zinc, 80–94 parts; copper, 2–8 parts; aluminum, 4–12 parts. The more zinc the less of the other metals is required. For flux use 3 parts copaiba balsam, and 1 part Venice turpentine. The operation is the same as that of brazing.

(13) D. D. S. asks what is the best kind of wire to use for an acoustic telephone, with a rawhide diaphragm, containing sixteen square inches, on a line of about 200 feet. Have tried copper, but it stretches in a few days, so that it does not work well? A. Twisted iron or steel cable cord is the best for this purpose. It does not continue to stretch like copper wire, and is free from the "ring" of a single wire.

(14) F. H. W. asks for a receipt for nickel plating. A. Use the double cyanide of nickel and potassium; plate the article in a bath of the double salt, using a battery; for positive electrode a plate of nickel must be employed. The metal is extremely hard to melt. There are many practical points in all electroplating which can only be learned by experience.

(15) M. J. B. asks: What will take the black off and clean a copper pan, such as is used in boiling sorghum molasses? A. If scrubbing it with sand will not do, try dilute nitric acid on it. Oxalic acid might be recommended, but is a violent poison.

(16) C. T. J. writes for a receipt for an alloy that is fusible by steam. A. 3 parts by weight of cadmium, 4 parts tin, 8 parts lead, 15 parts bismuth melts far below the temperature of boiling water.

(17) C. K. asks how to obtain the extract from sumac, and what is the cheapest way, and at the same time will give greatest percentage of tannin. A. Soak it out with successive additions of very hot water, pouring off after each addition and finally filtering the united decantations.

(18) C. A. R. asks how to determine the amount of soda ash in a gallon of (soda ash) liquor of any given degree; or some work on the subject. A. You will find the process given in detail in the chemistries and cyclopedias. Your best plan is to have a chemist give you practical instruction in the process. We cannot undertake to explain it at length here. In all chemical operations practice is most essential.

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October 2, 1883,

AND EACH BEARING THAT DATE.

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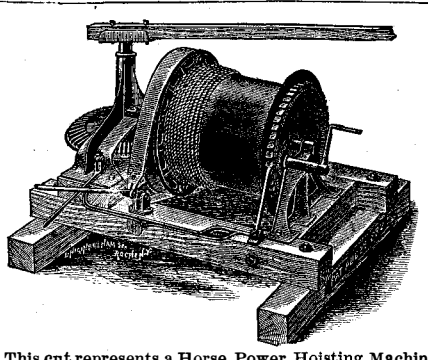

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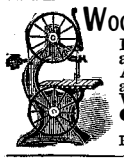

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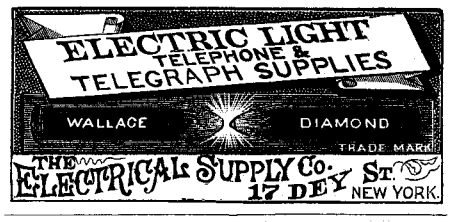

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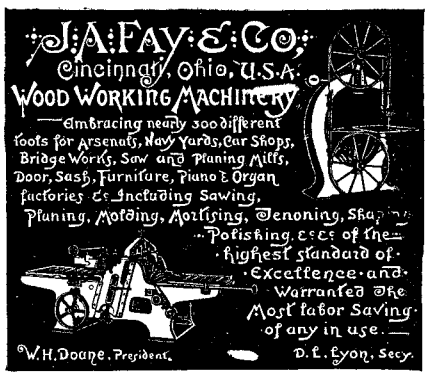
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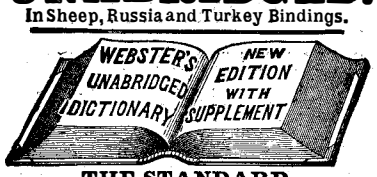

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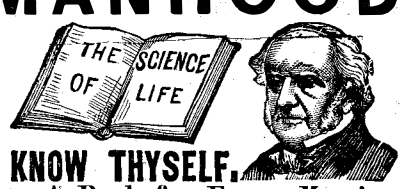

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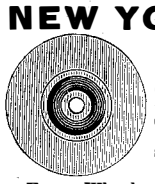

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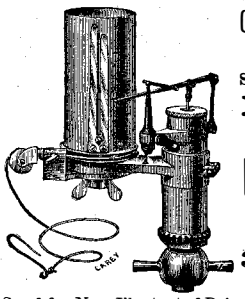

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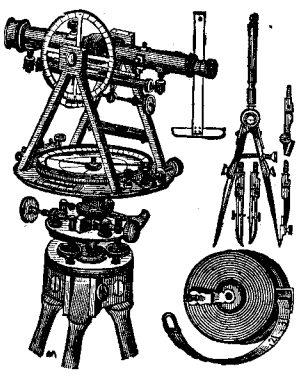

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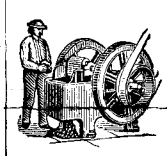

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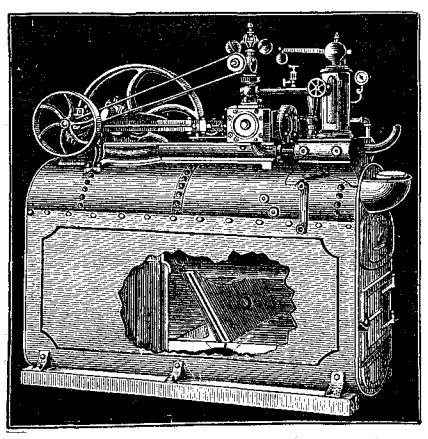

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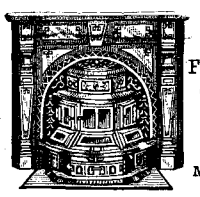

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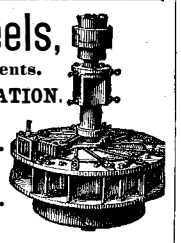

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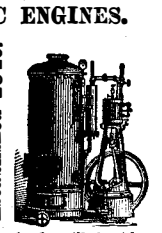

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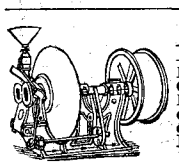

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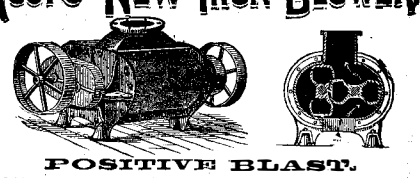

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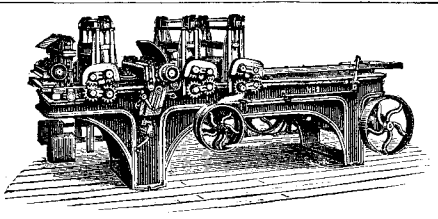

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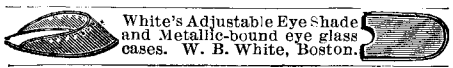

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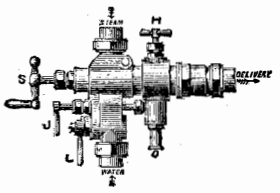

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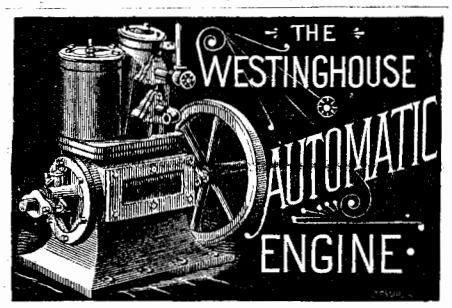

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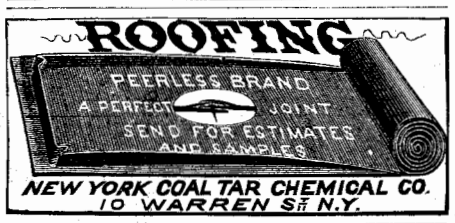

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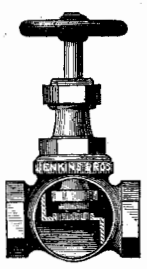

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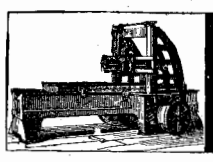

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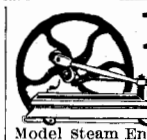

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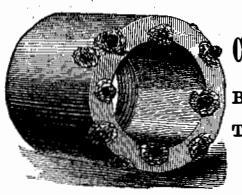

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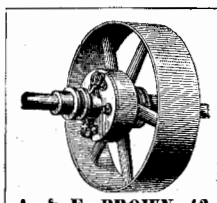

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